# Ambient Air Quality Monitoring
# Opportunity and Warm Springs Sites
# Second Quarter of 2009

Prepared for

Anaconda Deer Lodge County

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**APPENDICES**



**ATTACHMENTS**

## 1.0 INTRODUCTION

This quarterly report documents the ambient air quality monitoring program conducted by Kuipers & Associates on behalf of Anaconda Deer Lodge County at Opportunity and Warm Springs locations adjacent to the Atlantic Richfield Lower Waste Management Area. The months of April through June 2009 are included in this quarterly report, with a more detailed data summary in the monthly reports.

Objectives of this quarterly report include the following:

- Summarize the PM10 and Total Suspended Particulate (TSP) data on a quarterly basis and compare to applicable standards.
- Compare daily average TSP values recorded by the Opportunity Site against the PM10 values reported by the Atlantic Richfield Company's South Site.
- Present summarized meteorological data for the quarter.
- Present summarized results for ambient dust sampling conducted during the quarter.
- Present the Data Quality Summary (PM10, TSP and meteorological).
    - Review the hourly data according to the Environmental Protection Agency's Air Quality System Null Data Qualifier Codes.
    - Format hourly PM10 and TSP data for each month to fit the Environmental Protection Agency's Air Quality System raw data template.

Figure 1 shows the ADLC monitoring locations in Opportunity and Warm Springs, and the Atlantic Richfield Company’s South Site monitoring location.


ADLC Warm Springs PM10
ARCO North PM10
ADLC Opportunity TSP
ARCO South PM10
Feet
0 625 1,250 2,500 3,750 5,000
N
Water & Environmental Technologies
Anaconda Deer Lodge County
Air Quality Monitoring points
Figure 1

## 2.0 PM10 AND TSP DATA SUMMARY

The Met One E-BAM portable PM10 monitor at Warm Springs and the TSP monitor at Opportunity collected continuous hourly data at both locations from April 1 through June 30.

During the period of operation, data recovery was 96.1% at Opportunity and 95.4% at Warm Springs. Detailed ambient air quality monitoring results for the second quarter of 2009 are summarized in the April, May and June monthly reports prepared by Kuipers & Associates. A general discussion of ambient air quality monitoring data from the second quarter of 2009 is provided in the following sections. All PM10 and TSP data are reported at Local temperature and pressure (LTP) conditions.

### 2.1 Opportunity Site

At the Opportunity location daily average TSP concentrations ranged from 1 to 103 $\mu g/m^3$ with an average of 15 $\mu g/m^3$ throughout the second quarter. The maximum daily average TSP reading of 103 $\mu g/m^3$ was observed on May 19, in conjunction with strong southwest winds that shifted to the north-northeast. The corresponding daily average PM10 concentration reported by the adjacent ARCO South sampler was 15 $\mu g/m^3$. This indicates that most of the airborne dust was larger than 10 microns in diameter, which is consistent with the high wind speeds. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was 45 $\mu g/m^3$ in April, 78 $\mu g/m^3$ in May and 75 $\mu g/m^3$ in June. Daily average TSP concentrations for the quarter are presented in Figure 2 for the Opportunity monitoring site, and also in Appendix A.

Currently, there is no ambient air quality standard for TSP. However, all daily average TSP results for the second quarter of 2009 at Opportunity were well below the historical 24-hour Montana Ambient Air Quality Standard of 200 $\mu g/m^3$.

No Opportunity TSP data from the second quarter was rejected or omitted for quality assurance or quality control check results. Minor data losses occurred due to maintenance activities and power outages. Additionally, a total of 74 hours of TSP data were excluded in May because a method detection limit (MDL) test was in progress.

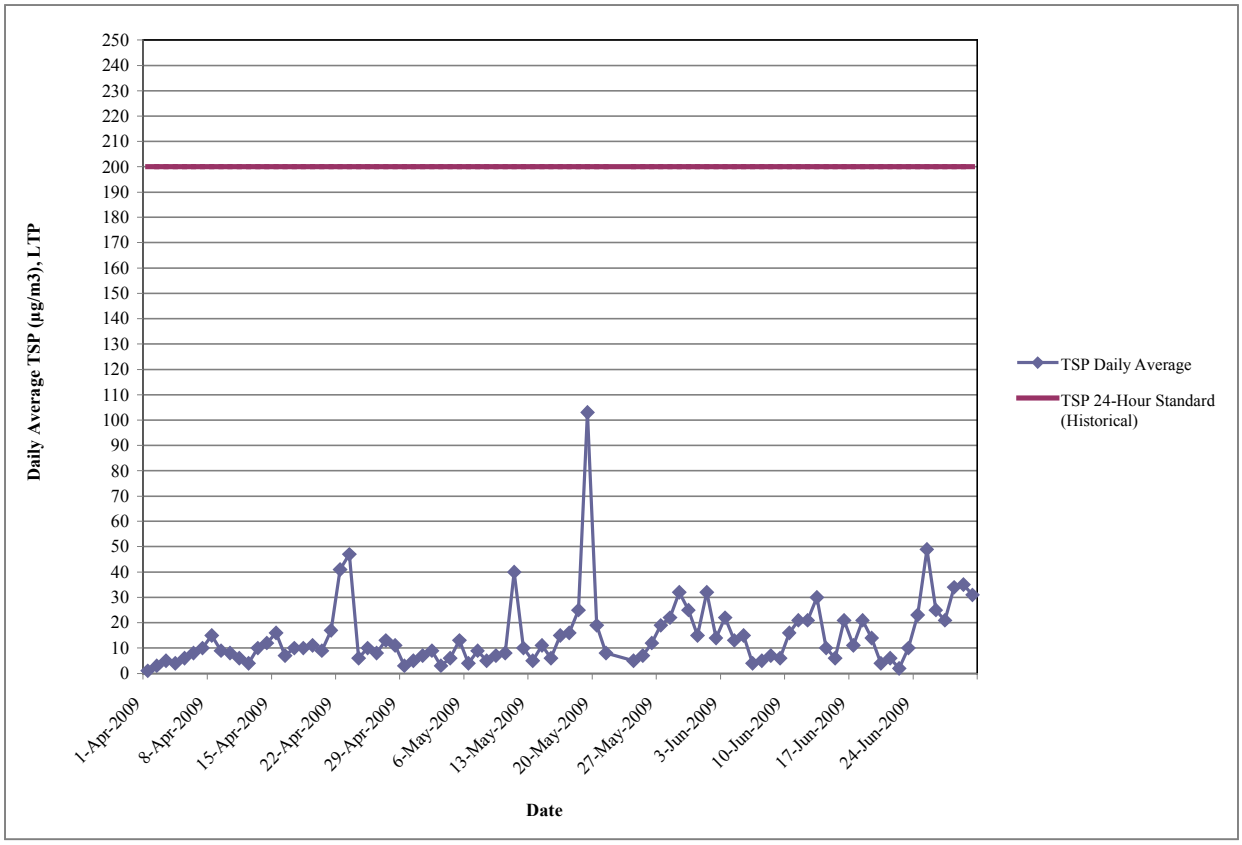


**FIGURE 2– OPPORTUNITY SITE DAILY AVERAGE TSP CONCENTRATION**

## 2.2 Warm Springs Site

At the Warm Springs location daily average PM10 concentrations ranged from non-detect to 20 µg/m$^3$ with a quarterly average of 5 µg/m$^3$. The maximum daily average PM10 reading of 20 µg/m$^3$ was observed on May 19, the same date that the highest 24-hour average TSP level was observed at Opportunity. The highest hourly concentrations on May 19 were accompanied by strong south to southwest winds. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was 19 µg/m$^3$ in April, 25 µg/m$^3$ in May and 32 µg/m$^3$ in June. Daily PM10 average concentrations for the second quarter are presented in Figure 3 for the Warm Springs monitoring site, and also in Appendix A.

All daily average PM10 results for the second quarter of 2009 at Warm Springs were well below the 24-hour Montana Ambient Air Quality Standard of 150 µg/m$^3$. No Warm Springs PM10 data from the second quarter was rejected or omitted for quality assurance or quality control reasons. Minor data losses occurred due to maintenance activities and power outages. Additionally, a total of 74 hours of PM10 data were excluded in May because an MDL (method detection limit) test was in progress.

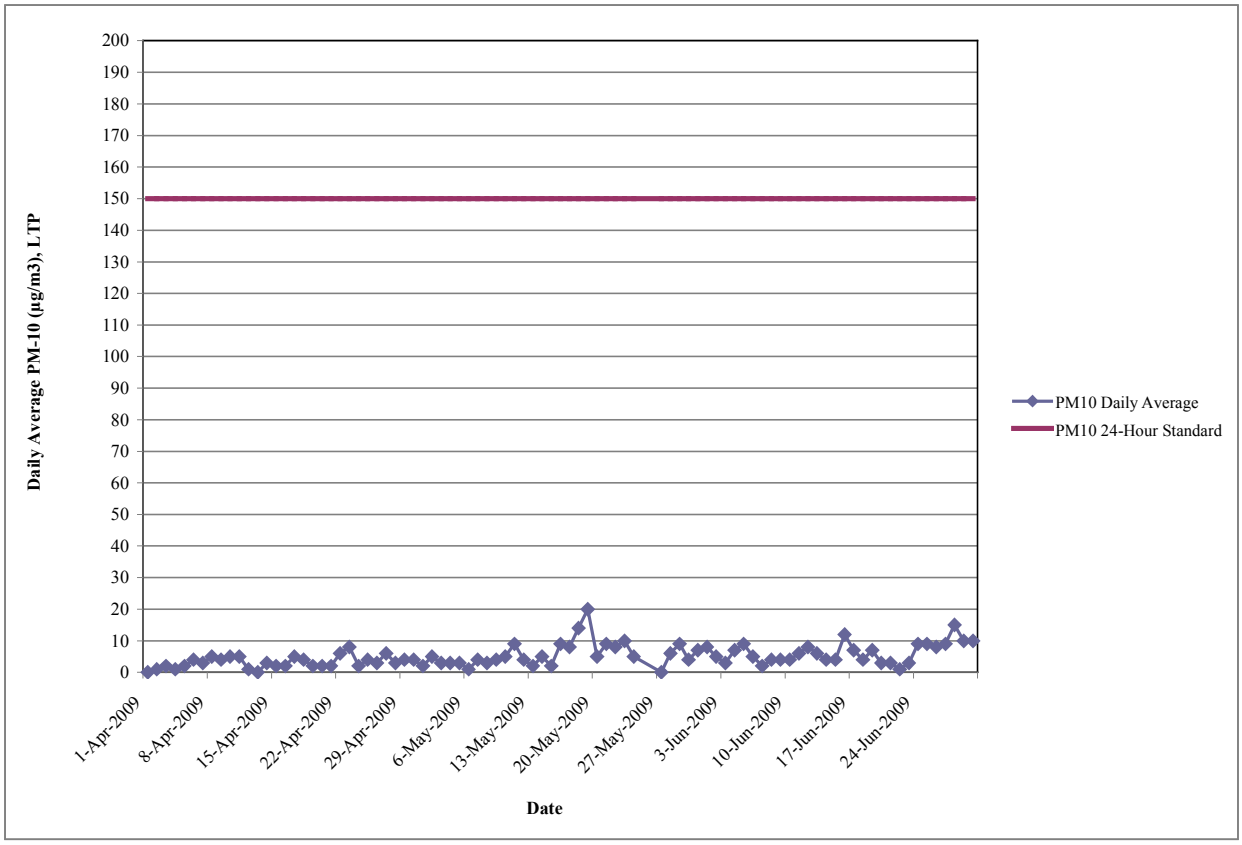


**FIGURE 3 - WARM SPRINGS SITE DAILY AVERAGE PM10 CONCENTRATION**

## 3.0 COLLOCATED PARTICULATE MONITORING RESULTS COMPARISON

Daily average (24-hour) results from the ADLC E-BAM TSP monitor at the Opportunity site were compared to the Atlantic Richfield Wedding PM10 monitors at the South Site for the quarter. The ADLC monitor collects screening level data, while the Atlantic Richfield monitors follow a federal reference method (FRM) required for compliance with air quality standards. While these are different measurements, collocated PM10 data collected at Opportunity from May 2007 through June 2008 indicated good general agreement between the E-BAM and Wedding PM10 monitoring systems. Therefore, a comparison of the E-BAM TSP data versus Wedding PM10 data should provide an indication of the ratio of total airborne particulate to the inhalable fraction (PM10).

The individual collocated results are listed in Table 1, and depicted graphically in Figure 4. While the ratio shows high day-to-day variability –particularly at lower concentrations – on average the total amount of airborne particulate (TSP) was nearly quadruple the amount of inhalable particulate (PM10). This relationship is fairly consistent whether one calculates the average of the daily TSP/PM10 ratios (3.92), or a total mass ratio (3.70). This is higher than the ratios observed during previous quarters, which were typically between 2:1 and 3:1. The diagonal line on Figure 4 represents a best-fit linear regression of TSP against daily average PM10 values.

**TABLE 1 – COLLOCATED RESULTS FOR TSP VS. PM10**
**DAILY AVERAGE VALUES**
**SECOND QUARTER 2009**
(All values are $\mu g/m^3$ at Local temperature and pressure (LTP))

| Date | Standard ARCO - PM-10 Wedding FRM South Site | Test ADLC - TSP Met One E-BAM Opportunity Site | TSP as Percent of PM-10 | TSP as Percent of PM-10 Cumulative |
|---|---|---|---|---|
| April 1, 2009 | 0 | 1 | N/A | N/A |
| April 4, 2009 | 1 | 4 | 400 | 500 |
| April 7, 2009 | 2 | 10 | 500 | 500 |
| April 10, 2009 | 2 | 8 | 400 | 460 |
| April 13, 2009 | 1 | 10 | 1000 | 550 |
| April 16, 2009 | 1 | 7 | 700 | 571 |
| April 19, 2009 | 1 | 11 | 1100 | 638 |
| April 25, 2009 | 4 | 10 | 250 | 508 |
| April 28, 2009 | 0 | 11 | N/A | 600 |
| May 1, 2009 | 3 | 7 | 233 | 527 |
| May 4, 2009 | 2 | 6 | 300 | 500 |
| May 7, 2009 | 2 | 9 | 450 | 495 |
| May 10, 2009 | 5 | 8 | 160 | 425 |
| May 13, 2009 | 1 | 5 | 500 | 428 |
| May 16, 2009 | 6 | 15 | 250 | 394 |
| May 19, 2009 | 15 | 103 | 687 | 489 |
| May 25, 2009 | 4 | 7 | 175 | 464 |
| May 28, 2009 | 7 | 22 | 314 | 446 |
| May 31, 2009 | 6 | 15 | 250 | 427 |
| June 3, 2009 | 7 | 22 | 314 | 416 |
| June 6, 2009 | 4 | 4 | 100 | 399 |
| June 12, 2009 | 7 | 21 | 300 | 390 |
| June 15, 2009 | 4 | 6 | 150 | 379 |
| June 18, 2009 | 6 | 21 | 350 | 377 |
| June 21, 2009 | 4 | 6 | 150 | 367 |
| June 24, 2009 | 6 | 23 | 383 | 368 |
| June 30, 2009 | 8 | 31 | 388 | **370** |

| | |
|---|---|
| Mean | 392 |
| Maximum | 1100 |
| Minimum | 100 |

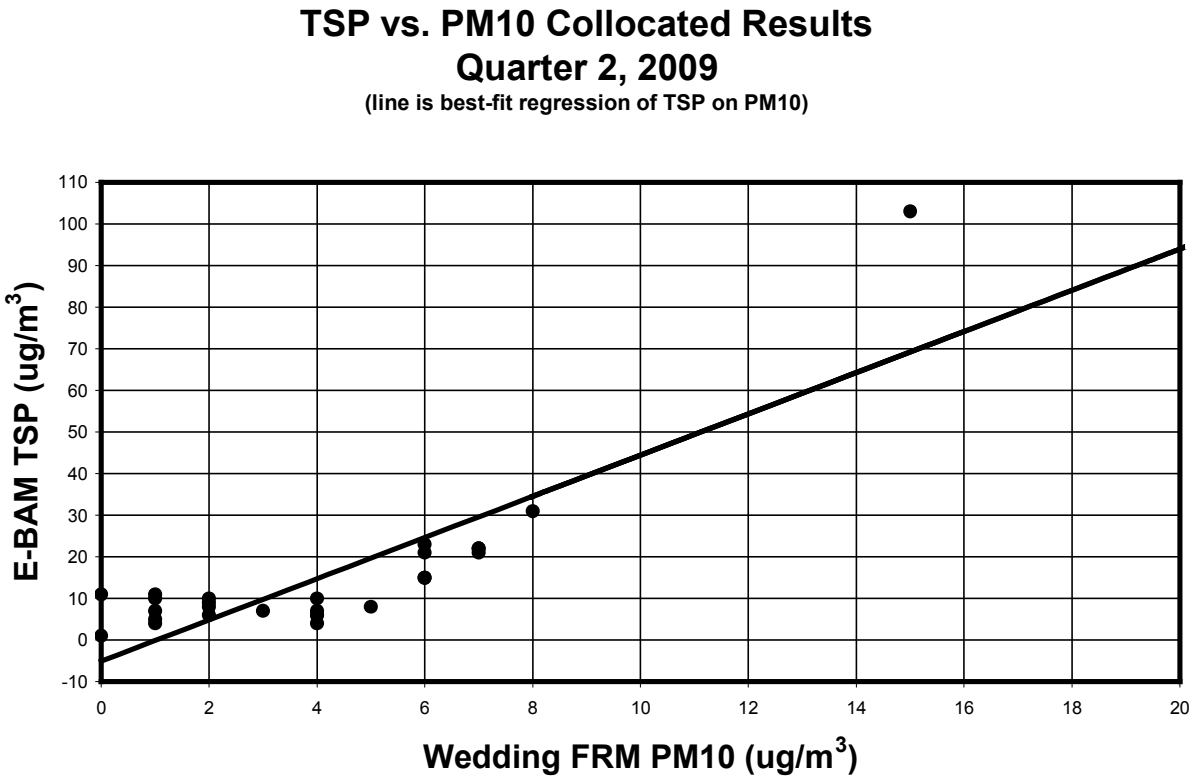


**FIGURE 4 – COLLOCATED RESULTS COMPARISON FOR ADLC OPPORTUNITY E-BAM (TSP) AND ATLANTIC RICHFIELD WEDDING FRM (PM10)**

## 4.0 DUST MONITORING RESULTS

Starting August 15, 2008, clean 9-inch diameter glass dishes were set out at both sites at a height of approximately 7 feet to capture and retain settling dust. A personal sampling pump supplied by SKC, Inc. was used to vacuum any settled dust from the dishes during twice-weekly site visits. Vacuuming could not be performed when standing water was present. In those instances, the water was allowed to evaporate, and vacuuming was performed at the next opportunity.

The vacuumed dust was collected onto 37-mm diameter, matched weight mixed cellulose ester (MCE) filter cassettes and submitted for analysis. The samples were analyzed for arsenic, cadmium, copper, lead and zinc, as well as total dust weight.

Settled dust samples were collected at both sites during the second quarter of 2009. Results are summarized in Table 2. A memorandum discussing the collection and analysis of the dust samples is presented in Appendix B, including any data quality concerns. The laboratory analysis report is presented in Attachment 1.

Additional sampling using dustfall jars was implemented in October 2008, but initial results were not reported because of laboratory weighing resolution issues. However, results for samples collected ending April 6, 2009 and June 1, 2009 are summarized in Table 2. A memorandum discussing the collection and analysis of the dust samples is presented in Appendix B, including any data quality concerns. The laboratory analysis report is presented in Attachment 1.

Selected exposed filters from the ARCO South samplers at Opportunity are analyzed for arsenic and lead concentrations, in addition to PM10. Average concentrations of arsenic and lead for the ARCO samples were calculated for the first two quarters of calendar year 2009 on a total mass basis, with a result of 167 mg/kg for arsenic and 266 mg/kg for lead. Although the sampling methods are much different, and the ARCO samplers collect only PM10 (rather than total particulate), the arsenic concentrations found in the Opportunity glass dish dust samples and dustfall samples are of similar magnitude to that calculated for the ARCO air samples. The lead concentrations found in the Opportunity samples appear to be somewhat lower than the corresponding ARCO result, but are still of the same order of magnitude.

## TABLE 2 – SUMMARY OF DUST MONITORING RESULTS

| Site / Sample Type | Collection Period | As (mg/kg) | Cd (mg/kg) | Cu (mg/kg) | Pb (mg/kg) | Zn (mg/kg) | Net Weight (mg) |
|---|---|---|---|---|---|---|---|
| Opportunity Settled Dust | 03/02/09 to 06/01/09 | 162 | 5.03 | 562 | 144 | 631 | 35.5 |
| Opportunity Settled Dust | 06/01/09 to 07/10/09 | 153 | 4.40 | 483 | 125 | 473 | 12.0 |
| Opportunity Dustfall | 03/02/09 to 04/05/09 | 122 | 10.6 | 372 | 31.7 | 2428 | 5.4 |
| Opportunity Dustfall | 04/05/09 to 06/01/09 | 148 | 5.60 | 458 | 101 | 713 | 41.5 |
| Warm Springs Settled Dust | 03/02/09 to 06/01/09 | 74.7 | 5.87 | 382 | 129 | 629 | 9.3 |
| Warm Springs Settled Dust | 06/01/09 to 07/10/09 | 29.5 | 15.8 | 211 | 92.6 | 367 | 1.6 |
| Warm Springs Dustfall | 03/02/09 to 04/05/09 | 140 | 28.3 | 597 | 49.7 | 3248 | 3.5 |
| Warm Springs Dustfall | 04/05/09 to 06/01/09 | 83.3 | 8.44 | 312 | 88.1 | 689 | 21.5 |

## 5.0 METEOROLOGICAL DATA SUMMARY

Meteorological data were collected continuously and recorded hourly at both the Opportunity and Warm Springs E-BAM monitoring sites. Parameters monitored include wind direction, wind speed, temperature and relative humidity. The data were collected at a height of approximately 8 feet above ground level.

Summarized meteorological data for these sites are presented and discussed in Sections 5.1 and 5.2. Detailed daily meteorological summaries are presented in Appendix A; information presented includes:

- Average, maximum and minimum air (shade) temperature for each day,
- Average and maximum hourly average wind speed for each day,
- Resultant wind direction for each day (weighted by wind speed – this is the mean direction from which the wind was blowing), and
- Average daily relative humidity.

Additionally, the summaries in Appendix A show the average daily and maximum daily PM10 and TSP concentrations, to facilitate correlation with the meteorological data.
Section 5.3 presents wind rose summaries for periods with elevated PM10 and TSP concentrations.

### 5.1 Opportunity Site

Figure 5 summarizes the meteorological data for the Opportunity site. Winds were generally light, averaging 2.3 m/s (5.1 mph). The highest recorded hourly wind speed was 8.5 m/s (19.0 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were below normal in April and June, and near normal in May. Monthly averages were 3.4°C (38.1°F) in April, 9.8°C (49.6°F) in May and 12.3°C (54.1°F) in June. Temperature extremes ranged from a low of –9.0°C (15.8°F) in April to a high of 28.6°C (83.5°F) in May. The average humidity for the quarter was 58%, with considerable daily variation.

Winds at the Opportunity site were mostly from the southwest quadrant, though northerly and north-northeasterly winds also were very common. The strongest winds tended to be from the west through southwest, and from the north and north-northeast.

Minor meteorological data losses occurred due to routine maintenance and short power outages, but none occurred due to data quality issues. Additionally, minor wind data losses occurred in April because of instrument icing during snow events.

**Part 1 – Means and Extremes**

| Parameter | April | May | June | Quarter |
|---|---|---|---|---|
| Average Wind Speed, m/s | 2.6 | 2.3 | 1.9 | 2.3 |
| Maximum (hourly) Wind Speed, m/s | 8.5 | 8.0 | 5.4 | 8.5 |
| Average Temperature, °C | 3.4 | 9.8 | 12.3 | 8.5 |
| Maximum Temperature, °C | 22.6 | 28.6 | 28.3 | 28.6 |
| Minimum Temperature, °C | -9.0 | -4.7 | -0.6 | -9.0 |
| Average Relative Humidity, % | 60 | 53 | 61 | 58 |
| *Refer to Appendix A for detailed daily meteorological summaries.* | | | | |

**Part 2 – Quarter 2, 2009 Wind Rose**

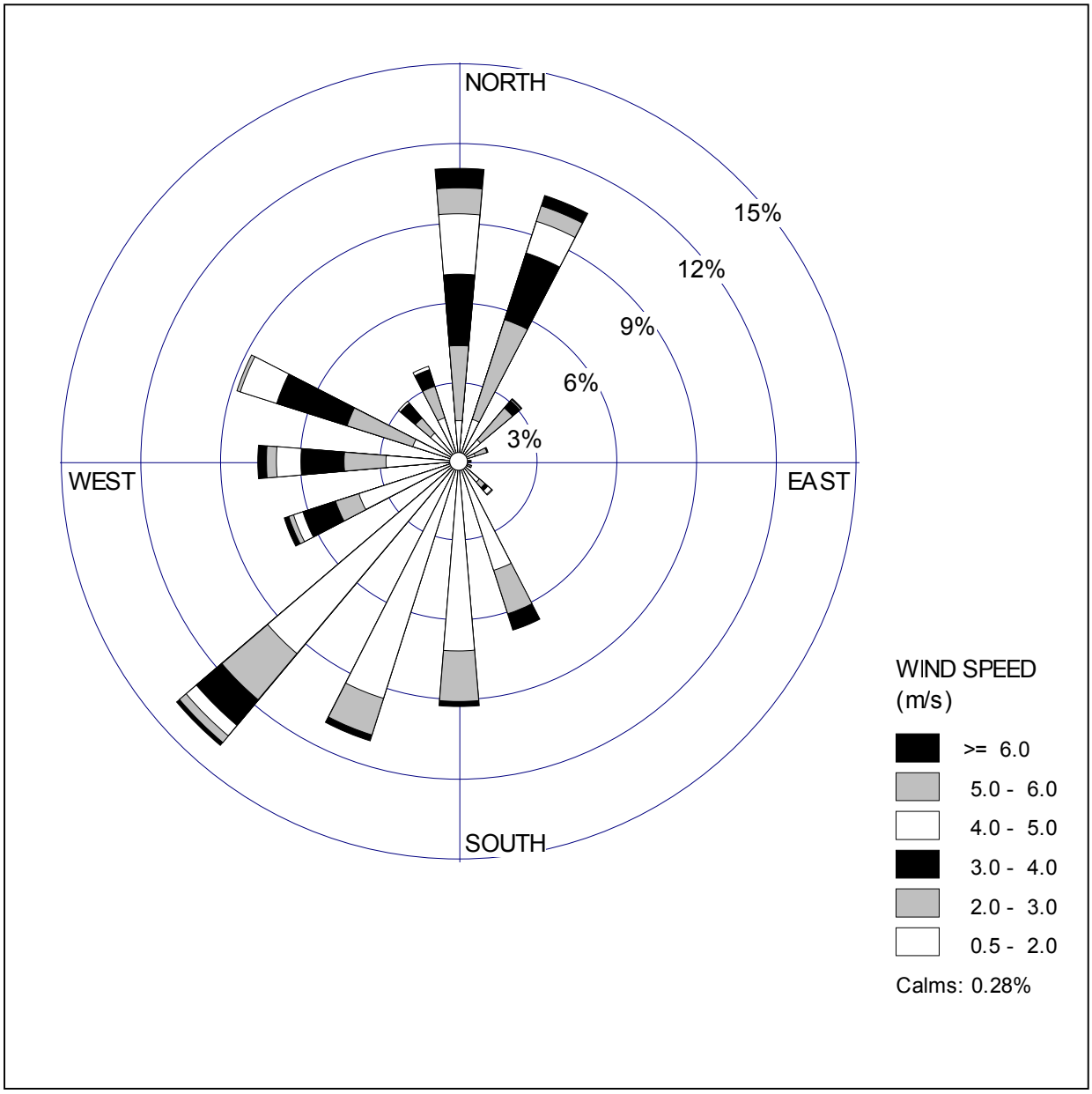


**FIGURE 5 – METEOROLOGICAL SUMMARY FOR OPPORTUNITY SITE**

## 5.2 Warm Springs Site

Figure 6 summarizes the meteorological data for the Warm Springs site. Winds were generally light, averaging 2.0 m/s (4.5 mph). The highest recorded hourly wind speed was 8.4 m/s (18.8 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were below normal in April and June, and near normal in May. Monthly averages were 3.2°C (37.8°F) in April, 9.8°C (49.6°F) in May and 12.8°C (55.0°F) in June. Temperature extremes ranged from a low of –9.1°C (15.6°F) in April to a high of 28.5°C (83.3°F) in June. The average humidity for the quarter was 58%, with considerable daily variation.

Winds at the Warm Springs site were mostly from southerly directions, though northerly winds also were common. Westerly winds, while occurring less frequently, were often the strongest.

Minor meteorological data losses occurred due to routine maintenance and short power outages, but none occurred due to data quality issues. Minor wind data losses occurred in April because of instrument icing during snow events. Additionally, some relative humidity data were invalidated during June because of a faulty signal cable connection.

**Part 1 – Means and Extremes**

| Parameter | April | May | June | Quarter |
|---|---|---|---|---|
| Average Wind Speed, m/s | 2.2 | 2.3 | 1.6 | 2.0 |
| Maximum (hourly) Wind Speed, m/s | 6.2 | 8.4 | 5.3 | 8.4 |
| Average Temperature, °C | 3.2 | 9.8 | 12.8 | 8.6 |
| Maximum Temperature, °C | 22.5 | 28.1 | 28.5 | 28.5 |
| Minimum Temperature, °C | -9.1 | -4.0 | 0.2 | -9.1 |
| Average Relative Humidity, % | 60 | 53 | 62 | 58 |
| *Refer to Appendix A for detailed daily meteorological summaries.* | | | | |

**Part 2 – Quarter 2, 2009 Wind Rose**

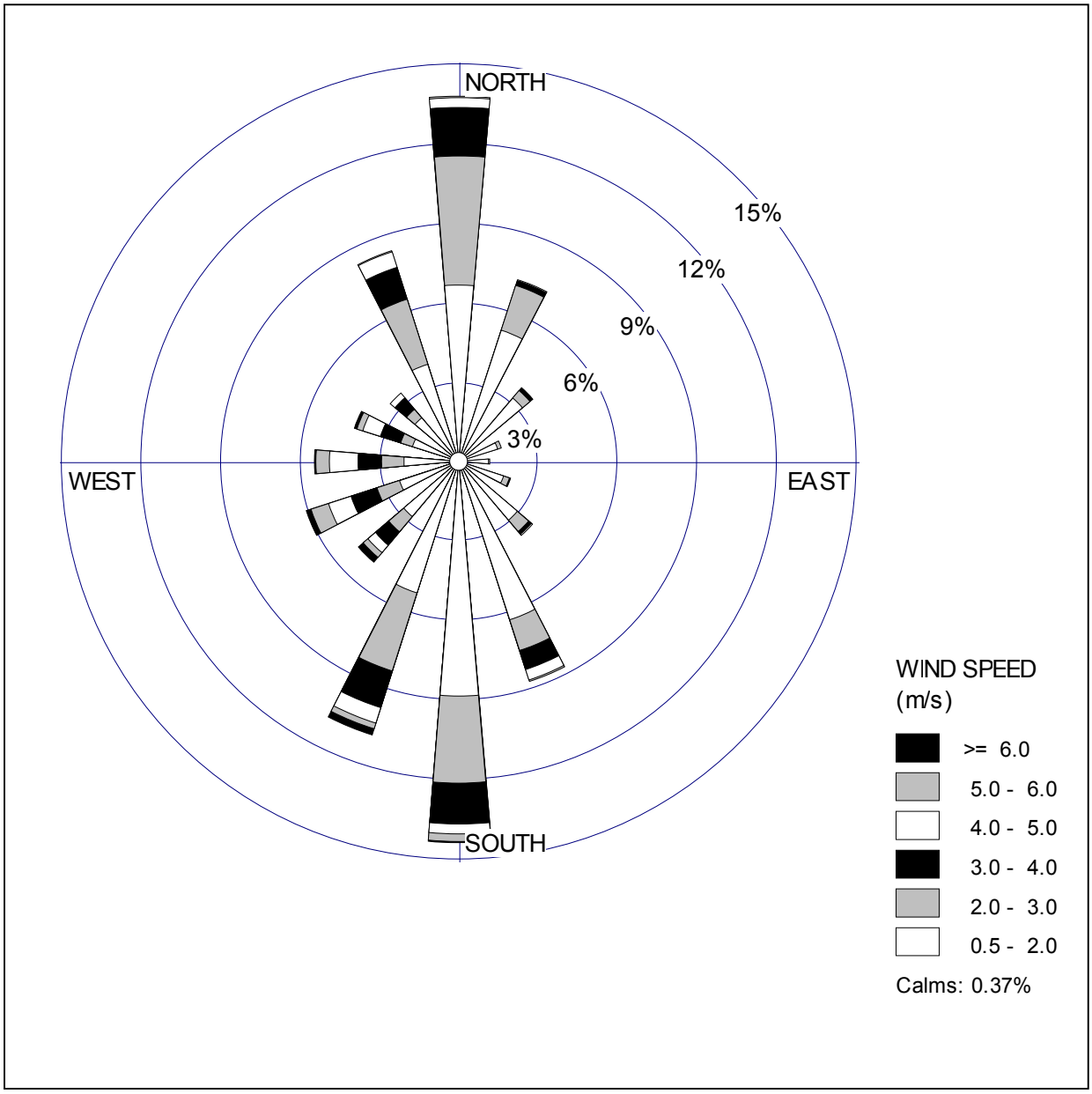


**FIGURE 6 – METEOROLOGICAL SUMMARY FOR WARM SPRINGS SITE**

## 5.3 Meteorological Conditions and Particulate Concentrations

Additional wind roses were generated for both monitoring sites to depict wind patterns during periods of elevated particulate concentrations – with the Opportunity site shown in Figure 7 and the Warm Springs site shown in Figure 8. For this analysis, "elevated" was defined as TSP concentrations greater than or equal to 45 $\mu g/m^3$ at Opportunity, and PM10 concentrations of greater than or equal to 20 $\mu g/m^3$ at Warm Springs. These thresholds – corresponding to roughly the 95$^{th}$ percentile at both sites– were used to ensure that a sufficient volume of data was incorporated to produce meaningful wind rose results.

When comparing the wind roses for the Opportunity site (Figures 5 and 7), it is evident that wind speeds were often higher during elevated TSP conditions. This is reasonable, since the larger – and therefore heavier – particulates collected by a TSP monitor would require greater wind activity to be entrained into the air. The wind direction distribution during elevated TSP periods was also notably different from the overall pattern, with northerly and especially north-northeast winds being more pronounced than at other times.

The corresponding wind roses for the Warm Springs site (Figures 6 and 8) show that winds were often stronger during elevated PM10 periods. However, the distribution of wind directions did not differ greatly from the overall pattern seen in Figure 6.

These results suggest that TSP levels at Opportunity are influenced by the Opportunity tailings area during strong north and northeast winds, and that elevated PM10 levels at Warm Springs are associated with higher wind speeds, but not necessarily winds from the tailings area.

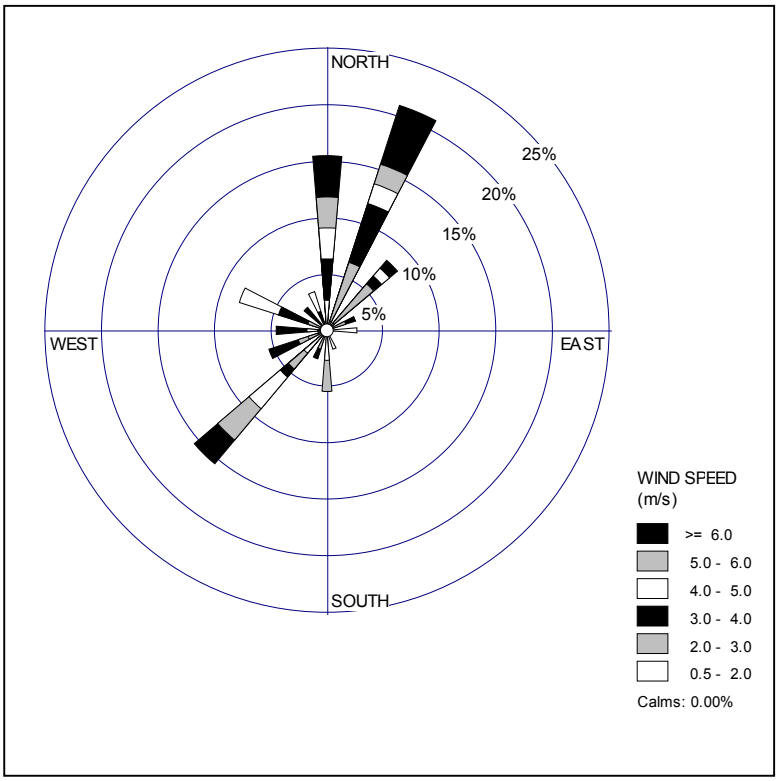


**FIGURE 7 – OPPORTUNITY WIND ROSE FOR ELEVATED TSP PERIODS**

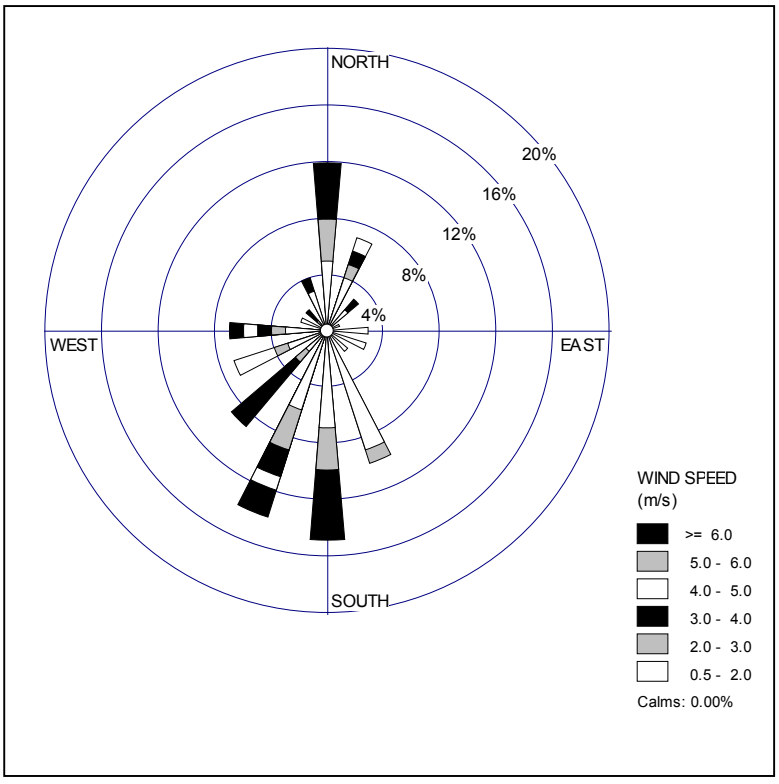


**FIGURE 8 – WARM SPRINGS WIND ROSE FOR ELEVATED PM10 PERIODS**

## 6.0 DATA QUALITY SUMMARY

Data quality is an integral part of any ambient monitoring program. The data collected must be of a known quality to be used for evaluation of local air quality and meteorological characteristics. This is particularly important when an objective of a monitoring program is to identify possible emission sources, and meteorological events associated with certain ambient air quality conditions – in this case elevated PM10 or TSP levels.

The Opportunity and Warm Springs monitoring systems were checked and/or calibrated (as appropriate for each monitoring parameter) monthly during the second quarter of 2009. This was accomplished via performance checks using standards that were either:

- Traceable to NIST; or
- Otherwise certified by the test equipment manufacturer.

Each instrument response was recorded, and evaluated to determine whether it fell within its respective acceptance range. In the event that a response fell outside (or near the limits of) the applicable acceptance range, the monitor or sensor in question was adjusted or recalibrated as appropriate. Such results then must be evaluated, in conjunction with a detailed data review, to identify data periods that must be flagged or invalidated.

Minor sampler maintenance was also performed on a monthly basis. Additionally, data were reviewed frequently via satellite link, and inspected for any suspicious behavior requiring investigation.

### 6.1 Summary of Performance Check / Maintenance Activities

Performance checks and minor maintenance were conducted on a monthly basis. Table 3 summarizes checks and maintenance for the E-BAM sampler itself, while Table 4 lists the meteorological checks. Information presented includes:

- The instrument model and serial number for each component of the monitoring system;
- Each type of check/maintenance performed on that component;
- Performance acceptance ranges; and
- A description of the calibration standard (and its traceability) used to perform each check.

Additionally, an MDL (method detection limit) test was conducted for both E-BAM samplers during May. For the Opportunity sampler, the 24-hour MDL was calculated at 1.8 $\mu g/m^3$, and the one-hour MDL at 9.0 $\mu g/m^3$. For the Warm Springs sampler, the 24-hour MDL was calculated at 2.5 $\mu g/m^3$, and the one-hour MDL at 12.2 $\mu g/m^3$. The manufacturer states a one-hour MDL of 6 $\mu g/m^3$; therefore a second MDL test will be conducted during the latter part of 2009.

## 6.2 Data Quality Issues

In general, performance checks and maintenance activities conducted throughout the second quarter of 2009 indicted that the E-BAM samplers were meeting performance objectives. The performance check procedures and routine maintenance activities are discussed in detail in Appendix C. Results for the second quarter of 2009 are presented in Appendix D. All E-BAM sampler test results obtained during the second quarter of 2009 were satisfactory.

Causes of data losses during the second quarter included the following:

- A total of 74 hours of TSP data at Opportunity, and 74 hours of PM10 data at Warm Springs, were excluded from analysis because an MDL test was being conducted.
- A total of 13 hours of PM10 data at Warm Springs were lost due to a sampler flow failure.
- A total of 15 hours of wind data at Opportunity, and 31 hours at Warm Springs, were invalidated because of suspected icing of the wind instruments.
- A total of 55 hours of relative humidity data at Warm Springs were invalidated because of a faulty cable connection
- A total of 5 hours of data were lost at Warm Springs due to power outages.
- Additional minor data losses occurred at both sites due to routine maintenance.

## TABLE 3 – SUMMARY OF PERFORMANCE CHECKS E-BAM SAMPLER

### Met One E-BAM $PM_{10}$ and TSP Samplers

| Instrument | Model | Serial No. | | Check Description | | | |
|---|---|---|---|---|---|---|---|
| | | *OPP* | *WS* | *Check Description* | *Acceptance Range* | *Check/Cal. Standard* | *Traceability* |
| Particulate Sampler | E-BAM | F7290 (TSP) | F7289 ($PM_{10}$) | Leak Check | <1.5 LPM | BX-302 valve | N/A |
| | | | | Operating Flow | +/- 2% (+/- 0.33 LPM) | Delta Cal S/N 000498 | MFR/NIST |
| | | | | Pump Test | (1) | BX-302 valve | N/A |
| | | | | Zero/Span | Pass / Fail | Membrane Plates | MFR |
| | | | | Clean Vane & Nozzle | (2) | N/A | N/A |
| | | | | Clean PM10 Head | N/A | N/A | N/A |
| Barometer (3) | E-BAM | F7290 | F7289 | Collocated | +/- 2 mmHg | Aneroid Barometer | Mercury Barometer |

### Explanatory Notes for Table 3

N/A = Not applicable
MFR/NIST = Certified traceable to NIST by the manufacturer
MFR = Certified accurate per Met One's E-BAM-6100 Final Test Procedure
(1) Acceptance range varies with test flow rate, see Appendix C for discussion.
(2) Leak check performed following cleaning, result must be <1.5 LPM.
(3) Barometer is internal to E-BAM sampler.

## TABLE 4 – SUMMARY OF PERFORMANCE CHECKS METEOROLOGICAL INSTRUMENTS

### Met One Meteorological Instruments

| Instrument (1) | Model | Serial No. | | Check Description | | | |
|---|---|---|---|---|---|---|---|
| | | *OPP* | *WS* | *Check Description* | *Acceptance Range* | *Check/Cal. Standard* | *Traceability* |
| Temperature | 9250 | F9487 | F9481 | Collocated | +/- 0.5 °C | Assmann Psychrometer | NIST |
| Relative Humidity | 593 | F9346 | F9349 | Collocated | +/- 5% Relative Humidity | Assmann Psychrometer | NIST |
| Wind Speed | 0348 | G2181 | G2187 | Collocated | +/- 0.5 m/s | Met One 010 Sensor | NIST |
| | | | | Rotation Check | +/- 0.2 m/s | Synchronous Motor | MFR |
| Wind Direction | 0348 | G2181 | G2187 | Initial Alignment | +/- 2 degrees | Solar Sighting | NIST Time |
| | | | | Linearity | +/- 3 degrees | Visual Crossarm Alignment (2) | N/A |

### Explanatory Notes for Table 4

(1) All meteorological instruments include certificate of NIST traceability from Met One, valid for a period of one year.
(2) Linearity checked by visually aligning wind vane in 90-degree increments with respect to crossarm.

MFR = Motor rotation rate provided by manufacturer.

## 7.0 AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES

Invalid hours for the quarter are summarized in Table 5 for the Opportunity site, and Table 6 for the Warm Springs site. The complete PM10 and TSP data sets for the quarter, and current qualifier codes are presented in Appendix E.

## TABLE 5 – OPPORTUNITY SITE INVALID DATA PERIODS QUARTER 2, 2009

### Part A – TSP

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 4-1-2009 | 1600 | 2300 | Tape change | BA |
| 4-5-2009 | 1600 | 2300 | Monthly checks | BA |
| 5-1-2009 | 1300 | 2000 | Tape change | BA |
| 5-4-2009 | 1700 | | Spurious reading | AM |
| 5-5-2009 | | 0000 | Spurious reading | AM |
| 5-21-2009 | 1300-2300 | 2000-2300 | MDL check | BA |
| 5-22-2009 | 0000-2300 | 0000-2300 | MDL check | BA |
| 5-23-2009 | 0000-2300 | 0000-2300 | MDL check | BA |
| 5-24-2009 | 0000-1400 | 0000-2100 | MDL check | BA |
| 5-27-2009 | 1700 | | Monthly check | BA |
| 5-28-2009 | | 0000 | Monthly check | BA |
| 6-1-2009 | 1000-1200 | 1700-1900 | Remove tape, troubleshooting | BA |
| 6-5-2009 | 1200 | 1900 | Check downtube | BA |
| 6-12-2009 | 1300 | 2000 | Check downtube | BA |
| 6-22-2009 | 1300 | 2000 | Check downtube | BA |

### Part B – Wind Direction / Wind Speed

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 4-14-2009 | 0200-0800 | 0900-1500 | Instrument icing | AO |
| 4-23-2009 | 1900-2300 | | Instrument icing | AO |
| 4-24-2009 | 0000-0200 | 0200-0900 | Instrument icing | AO |
| 4-27-2009 | 1600 | 2300 | Monthly check | BA |
| 5-27-2009 | 1300 | 2000 | Monthly check | BA |
| 6-1-2009 | 1000-1200 | 1700-1900 | Troubleshooting | BA |

### Part C – Temperature / Relative Humidity

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 6-1-2009 | 1000-1200 | 1700-1900 | Troubleshooting | BA |

## TABLE 6 – WARM SPRINGS SITE INVALID DATA PERIODS QUARTER 2, 2009

### Part A – PM10

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 4-1-2009 | 1500 | 2200 | Tape change | BA |
| 4-1-2009 | 1800, 1900 | | Power outage | AV |
| 4-2-2009 | | 0100, 0200 | Power outage | AV |
| 4-5-2009 | 1400 | 2100 | Monthly check | BA |
| 4-10-2009 | 2000-2200 | | Power outage | AV |
| 4-11-2009 | | 0300-0500 | Power outage | AV |
| 5-1-2009 | 1200 | 1900 | Tape change | BA |
| 5-24-2009 | 1400-2300 | 2100-2300 | MDL check | BA |
| 5-25-2009 | 0000-2300 | 0000-2300 | MDL check | BA |
| 5-26-2009 | 0000-2300 | 0000-2300 | MDL check | BA |
| 5-27-2009 | 0000-1500 | 0000-2200 | MDL check | BA |
| 5-27-2009 | 1600 | 2300 | Monthly check | BA |
| 5-29-2009 | 1500 | 2200 | Clean down-tube base | BA |
| 6-1-2009 | 1300 | 2000 | Remove tape, check downtube | BA |
| 6-5-2009 | 1100 | 1800 | Check downtube | BA |
| 6-12-2009 | 1200 | 1900 | Check downtube | BA |
| 6-15-2009 | 2300 | | Flow fail | AH |
| 6-16-2009 | 0000-1100 | 0600-1800 | Flow fail | AH |
| 6-22-2009 | 1300 | 2000 | Check downtube | BA |

### Part B – Wind Direction / Wind Speed

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 4-1-2009 | 1800, 1900 | | Power outage | AV |
| 4-2-2009 | | 0100, 0200 | Power outage | AV |
| 4-2-2009 | 2300 | | Instrument icing | AO |
| 4-3-2009 | 0000-0800 | 0600-1500 | Instrument icing | AO |
| 4-10-2009 | 2000-2200 | | Power outage | AV |
| 4-11-2009 | | 0300-0500 | Power outage | AV |
| 4-14-2009 | 0300-0700 | 1000-1400 | Instrument icing | AO |
| 4-23-2009 | 1700-2300 | | Instrument icing | AO |
| 4-24-2009 | 0000-0800 | 0000-1500 | Instrument icing | AO |
| 4-27-2009 | 1600 | 2300 | Monthly check | BA |
| 5-27-2009 | 1600 | 2300 | Monthly check | BA |

**Part C – Temperature / Relative Humidity**

| Date | Invalid Hours (ending at) MST | Invalid Hours GMT | Reason | Data Invalidation Code |
|---|---|---|---|---|
| 4-1-2009 | 1800, 1900 | | Power outage | AV |
| 4-2-2009 | | 0100, 0200 | Power outage | AV |
| 4-10-2009 | 2000-2200 | | Power outage | AV |
| 4-11-2009 | | 0300-0500 | Power outage | AV |
| 6-26-2009 | 0000-0700 | 0700-1400 | Loose cable | AM (1) |
| 6-27-2009 | 0100-0700, 2100-2300 | 0800-1400 | Loose cable | AM (1) |
| 6-28-2009 | 0000-2300 | 0400-2300 | Loose cable | AM (1) |
| 6-29-2009 | 0000-1200 | 0000-1900 | Loose cable | AM (1) |
| (1) Relative humidity data only | | | | |

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# APPENDIX A

## MONTHLY DATA SUMMARIES
## SECOND QUARTER 2009

**OPPORTUNITY DAILY DATA SUMMARY - APRIL 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 11 | 2.4 | 4.1 | 271 | -1.4 | 1.8 | -5.8 | 60 |
| 2 | 3 | 24 | 2.4 | 4.3 | 228 | 0.0 | 4.4 | -4.1 | 71 |
| 3 | 5 | 20 | 2.8 | 6.3 | 7 | -1.6 | 2.9 | -7.2 | 72 |
| 4 | 4 | 24 | 3.2 | 4.7 | 9 | -0.8 | 3.5 | -6.7 | 64 |
| 5 | 6 | 25 | 1.6 | 3.5 | 163 | -0.6 | 8.4 | -9.0 | 58 |
| 6 | 8 | 23 | 2.0 | 3.8 | 182 | 4.6 | 14.5 | -3.6 | 50 |
| 7 | 10 | 38 | 1.9 | 3.7 | 204 | 6.8 | 17.0 | -1.9 | 48 |
| 8 | 15 | 40 | 2.4 | 5.3 | 228 | 8.6 | 15.7 | 3.0 | 50 |
| 9 | 9 | 23 | 2.1 | 4.1 | 17 | 3.9 | 7.2 | -1.2 | 77 |
| 10 | 8 | 24 | 1.5 | 5.1 | 213 | 4.8 | 11.8 | -1.3 | 68 |
| 11 | 6 | 16 | 2.2 | 4.5 | 270 | 6.1 | 13.0 | -0.3 | 65 |
| 12 | 4 | 19 | 2.1 | 3.2 | 244 | 7.1 | 13.7 | 0.3 | 46 |
| 13 | 10 | 39 | 3.0 | 6.2 | 330 | 3.9 | 8.7 | 0.4 | 71 |
| 14 | 12 | 40 | 3.2 | 4.6 | 1 | -0.3 | 2.4 | -2.1 | 70 |
| 15 | 16 | 67 | 5.7 | 7.5 | 3 | -1.4 | 0.6 | -3.3 | 68 |
| 16 | 7 | 19 | 2.2 | 3.6 | 10 | 1.0 | 4.8 | -2.1 | 67 |
| 17 | 10 | 52 | 2.1 | 4.4 | 250 | 5.6 | 15.0 | -5.1 | 51 |
| 18 | 10 | 28 | 2.1 | 4.5 | 299 | 6.8 | 13.4 | 0.0 | 43 |
| 19 | 11 | 28 | 2.6 | 6.1 | 246 | 8.3 | 16.2 | -0.7 | 42 |
| 20 | 9 | 28 | 3.0 | 6.1 | 262 | 12.9 | 20.1 | 4.6 | 35 |
| 21 | 17 | 43 | 2.5 | 4.6 | 239 | 13.5 | 22.6 | 3.3 | 36 |
| 22 | 41 | 235 | 2.8 | 6.3 | 235 | 12.7 | 21.1 | 3.4 | 38 |
| 23 | 47 | 248 | 3.1 | 8.5 | 9 | 2.0 | 9.2 | -2.9 | 74 |
| 24 | 6 | 23 | 2.1 | 4.2 | 297 | 0.4 | 6.4 | -5.3 | 58 |
| 25 | 10 | 23 | 2.2 | 4.2 | 10 | 1.2 | 8.3 | -7.4 | 53 |
| 26 | 8 | 33 | 3.1 | 5.4 | 13 | 1.1 | 5.4 | -4.7 | 68 |
| 27 | 13 | 50 | 2.8 | 5.2 | 53 | 0.5 | 8.4 | -6.8 | 69 |
| 28 | 11 | 58 | 4.0 | 6.7 | 2 | -2.0 | -0.8 | -3.3 | 82 |
| 29 | 3 | 17 | 4.3 | 6.2 | 2 | -2.1 | 0.6 | -3.7 | 74 |
| 30 | 5 | 23 | 1.5 | 3.0 | 5 | -0.5 | 4.1 | -4.6 | 72 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

**OPPORTUNITY DAILY DATA SUMMARY - MAY 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 17 | 1.4 | 2.5 | 173 | 3.2 | 10.1 | -3.7 | 59 |
| 2 | 9 | 29 | 1.5 | 3.2 | 158 | 6.0 | 14.8 | -4.4 | 55 |
| 3 | 3 | 19 | 2.4 | 4.3 | 193 | 6.7 | 13.5 | 2.3 | 74 |
| 4 | 6 | 17 | 2.5 | 4.1 | 258 | 6.7 | 12.5 | 1.0 | 47 |
| 5 | 13 | 66 | 3.5 | 8.0 | 246 | 7.8 | 13.5 | 4.6 | 63 |
| 6 | 4 | 20 | 2.2 | 4.5 | 259 | 6.5 | 10.0 | 2.3 | 64 |
| 7 | 9 | 37 | 3.2 | 5.7 | 273 | 3.6 | 6.1 | 1.1 | 62 |
| 8 | 5 | 20 | 2.3 | 3.6 | 298 | 4.1 | 9.4 | -0.9 | 59 |
| 9 | 7 | 48 | 1.4 | 2.9 | 20 | 4.9 | 13.1 | -3.6 | 52 |
| 10 | 8 | 21 | 1.8 | 3.7 | 304 | 6.5 | 14.1 | -3.1 | 51 |
| 11 | 40 | 557 | 2.5 | 4.7 | 274 | 8.5 | 16.2 | -1.6 | 51 |
| 12 | 10 | 34 | 2.7 | 6.2 | 270 | 1.4 | 4.3 | -0.7 | 69 |
| 13 | 5 | 24 | 2.8 | 4.8 | 248 | 5.1 | 11.1 | -0.6 | 47 |
| 14 | 11 | 45 | 3.3 | 5.7 | 243 | 7.5 | 13.8 | 3.6 | 59 |
| 15 | 6 | 27 | 2.2 | 4.0 | 328 | 7.3 | 14.4 | 0.8 | 55 |
| 16 | 15 | 33 | 2.0 | 4.3 | 250 | 11.2 | 21.1 | -1.0 | 43 |
| 17 | 16 | 43 | 2.0 | 3.9 | 248 | 16.2 | 25.9 | 7.1 | 38 |
| 18 | 25 | 53 | 2.3 | 4.3 | 229 | 18.9 | 28.6 | 6.8 | 38 |
| 19 | 103 | 536 | 4.4 | 7.8 | 278 | 15.7 | 25.9 | 6.5 | 40 |
| 20 | 19 | 50 | 3.1 | 4.9 | 320 | 7.9 | 12.3 | -1.5 | 39 |
| 21 | 8 | 18 | 2.0 | 4.5 | 15 | 8.1 | 18.2 | -4.7 | 40 |
| 22 | NO DATA | NO DATA | 2.0 | 4.8 | 6 | 10.8 | 20.9 | -0.4 | 45 |
| 23 | NO DATA | NO DATA | 2.3 | 4.5 | 158 | 14.9 | 24.5 | 1.5 | 49 |
| 24 | 5 | 14 | 1.9 | 4.1 | 344 | 10.5 | 14.4 | 7.0 | 83 |
| 25 | 7 | 18 | 1.7 | 4.1 | 116 | 10.8 | 18.3 | 3.8 | 68 |
| 26 | 12 | 34 | 1.9 | 3.6 | 229 | 13.8 | 21.7 | 3.6 | 52 |
| 27 | 19 | 65 | 2.0 | 3.5 | 258 | 14.1 | 22.4 | 3.5 | 47 |
| 28 | 22 | 60 | 1.8 | 3.4 | 246 | 15.3 | 24.7 | 4.4 | 45 |
| 29 | 32 | 175 | 1.7 | 4.4 | 263 | 15.3 | 25.6 | 6.4 | 56 |
| 30 | 25 | 133 | 1.7 | 2.8 | 183 | 17.1 | 25.2 | 9.5 | 53 |
| 31 | 15 | 51 | 2.3 | 4.2 | 256 | 17.0 | 24.0 | 9.1 | 41 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

**OPPORTUNITY DAILY DATA SUMMARY - JUNE 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 32 | 124 | 3.3 | 5.4 | 357 | 8.7 | 10.3 | 6.7 | 61 |
| 2 | 14 | 44 | 2.0 | 3.9 | 20 | 8.7 | 11.3 | 6.6 | 65 |
| 3 | 22 | 232 | 1.4 | 2.9 | 178 | 13.1 | 21.0 | 5.6 | 59 |
| 4 | 13 | 53 | 1.3 | 3.7 | 196 | 12.1 | 19.7 | 3.8 | 71 |
| 5 | 15 | 98 | 1.4 | 3.3 | 149 | 13.1 | 20.3 | 8.9 | 73 |
| 6 | 4 | 26 | 2.9 | 5.4 | 360 | 4.6 | 9.8 | 1.0 | 79 |
| 7 | 5 | 27 | 2.0 | 3.0 | 359 | 4.7 | 9.7 | 1.3 | 66 |
| 8 | 7 | 29 | 2.1 | 4.3 | 9 | 4.8 | 10.5 | -0.6 | 79 |
| 9 | 6 | 30 | 1.5 | 3.2 | 9 | 8.0 | 14.4 | 2.6 | 66 |
| 10 | 16 | 89 | 1.7 | 3.7 | 15 | 10.6 | 18.0 | 0.9 | 57 |
| 11 | 21 | 80 | 1.6 | 3.3 | 12 | 11.8 | 19.9 | 2.2 | 53 |
| 12 | 21 | 95 | 1.7 | 3.0 | 139 | 13.7 | 22.6 | 2.3 | 48 |
| 13 | 30 | 415 | 1.7 | 3.4 | 193 | 14.9 | 24.1 | 6.9 | 53 |
| 14 | 10 | 69 | 1.6 | 3.2 | 226 | 13.9 | 19.8 | 8.1 | 66 |
| 15 | 6 | 19 | 1.3 | 3.1 | 21 | 12.4 | 16.9 | 8.8 | 80 |
| 16 | 21 | 75 | 1.5 | 3.7 | 55 | 14.5 | 22.3 | 7.2 | 69 |
| 17 | 11 | 48 | 1.8 | 4.0 | 255 | 13.9 | 19.3 | 10.2 | 69 |
| 18 | 21 | 112 | 1.8 | 3.7 | 337 | 12.1 | 17.9 | 6.2 | 67 |
| 19 | 14 | 34 | 2.4 | 4.5 | 274 | 13.2 | 20.7 | 5.5 | 64 |
| 20 | 4 | 21 | 0.8 | 1.3 | 245 | 10.1 | 11.8 | 9.0 | 84 |
| 21 | 6 | 26 | 2.1 | 3.7 | 287 | 12.3 | 18.9 | 7.3 | 70 |
| 22 | 2 | 14 | 2.2 | 3.9 | 257 | 7.9 | 11.6 | 3.7 | 67 |
| 23 | 10 | 25 | 1.7 | 2.6 | 207 | 11.8 | 22.1 | 0.5 | 53 |
| 24 | 23 | 38 | 2.1 | 4.3 | 224 | 17.0 | 27.1 | 3.3 | 45 |
| 25 | 49 | 108 | 2.7 | 5.1 | 315 | 19.8 | 28.1 | 11.1 | 40 |
| 26 | 25 | 61 | 2.1 | 4.7 | 307 | 13.5 | 21.8 | 3.5 | 48 |
| 27 | 21 | 51 | 2.1 | 3.6 | 293 | 14.2 | 23.2 | 3.7 | 44 |
| 28 | 34 | 58 | 1.7 | 2.6 | 229 | 18.5 | 28.3 | 7.0 | 41 |
| 29 | 35 | 79 | 1.8 | 3.4 | 11 | 17.6 | 26.6 | 6.4 | 49 |
| 30 | 31 | 59 | 2.3 | 5.3 | 12 | 17.5 | 26.9 | 5.4 | 45 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

**WARM SPRINGS DAILY DATA SUMMARY - APRIL 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 (9) | 6 | 1.3 | 2.3 | 86 | -1.9 | 2.8 | -6.4 | 63 |
| 2 | 1 | 11 | 2.8 | 5.0 | 178 | -0.3 | 4.2 | -5.0 | 71 |
| 3 | 2 | 15 | 2.7 | 4.3 | 1 | -1.7 | 3.7 | -7.9 | 72 |
| 4 | 1 | 12 | 2.1 | 3.2 | 2 | -0.7 | 4.1 | -6.3 | 61 |
| 5 | 2 | 26 | 1.6 | 3.1 | 174 | -0.6 | 8.2 | -9.1 | 57 |
| 6 | 4 | 16 | 1.8 | 3.4 | 186 | 3.9 | 13.2 | -3.6 | 54 |
| 7 | 3 | 13 | 2.1 | 3.9 | 187 | 6.6 | 17.2 | -2.1 | 50 |
| 8 | 5 | 16 | 2.0 | 5.1 | 178 | 7.8 | 15.3 | 0.9 | 53 |
| 9 | 4 | 17 | 1.1 | 1.8 | 39 | 3.7 | 7.9 | -0.5 | 77 |
| 10 | 5 | 21 | 1.4 | 4.2 | 167 | 4.6 | 12.1 | -2.4 | 67 |
| 11 | 5 | 24 | 1.6 | 4.3 | 229 | 5.5 | 12.8 | -2.0 | 68 |
| 12 | 1 | 10 | 2.3 | 4.1 | 237 | 7.3 | 14.3 | 1.8 | 46 |
| 13 | 0 | 10 | 2.5 | 4.5 | 140 | 4.1 | 8.1 | 0.7 | 68 |
| 14 | 3 | 14 | 2.2 | 3.3 | 359 | 0.0 | 3.3 | -2.2 | 64 |
| 15 | 2 | 14 | 3.8 | 5.2 | 346 | -1.1 | 1.4 | -3.4 | 64 |
| 16 | 2 | 11 | 1.6 | 2.4 | 350 | 1.1 | 5.1 | -2.2 | 65 |
| 17 | 5 | 28 | 1.7 | 2.9 | 192 | 5.0 | 14.8 | -6.4 | 53 |
| 18 | 4 | 14 | 1.9 | 4.4 | 259 | 7.0 | 13.5 | 0.0 | 43 |
| 19 | 2 | 13 | 2.9 | 6.0 | 233 | 8.2 | 16.1 | -0.4 | 43 |
| 20 | 2 | 15 | 2.7 | 6.2 | 258 | 11.3 | 20.4 | 0.7 | 42 |
| 21 | 2 | 15 | 3.2 | 5.5 | 226 | 13.0 | 22.5 | 3.3 | 37 |
| 22 | 6 | 24 | 2.7 | 4.7 | 233 | 12.5 | 21.0 | 3.1 | 39 |
| 23 | 8 | 52 | 1.9 | 4.3 | 360 | 1.3 | 9.6 | -4.1 | 76 |
| 24 | 2 | 15 | 2.0 | 4.1 | 300 | 0.0 | 6.3 | -6.4 | 57 |
| 25 | 4 | 16 | 2.1 | 3.5 | 8 | 1.5 | 9.0 | -6.3 | 53 |
| 26 | 3 | 18 | 1.9 | 3.0 | 12 | 1.3 | 6.2 | -4.2 | 66 |
| 27 | 6 | 27 | 2.3 | 4.3 | 16 | 0.4 | 7.9 | -6.0 | 70 |
| 28 | 3 | 32 | 3.0 | 4.8 | 355 | -2.0 | -0.6 | -3.3 | 81 |
| 29 | 4 | 30 | 3.1 | 3.9 | 354 | -2.1 | 0.8 | -4.0 | 73 |
| 30 | 4 | 20 | 1.3 | 2.3 | 347 | -0.6 | 4.3 | -4.6 | 70 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds
(9) Negative value detected, zero reported

**WARM SPRINGS DAILY DATA SUMMARY - MAY 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 15 | 1.6 | 2.7 | 164 | 3.3 | 10.3 | -4.0 | 58 |
| 2 | 5 | 19 | 1.5 | 3.1 | 284 | 6.3 | 14.8 | -2.8 | 54 |
| 3 | 3 | 15 | 2.4 | 5.4 | 173 | 6.9 | 13.9 | 2.1 | 72 |
| 4 | 3 | 22 | 3.5 | 6.1 | 231 | 6.8 | 12.6 | 1.4 | 48 |
| 5 | 3 | 21 | 4.0 | 7.5 | 200 | 7.9 | 14.7 | 2.7 | 62 |
| 6 | 1 | 13 | 2.4 | 4.4 | 206 | 7.0 | 10.5 | 3.8 | 61 |
| 7 | 4 | 24 | 3.2 | 6.0 | 250 | 4.0 | 7.2 | 1.1 | 59 |
| 8 | 3 | 16 | 2.0 | 3.9 | 270 | 4.1 | 10.0 | 0.0 | 58 |
| 9 | 4 | 20 | 1.6 | 2.8 | 176 | 5.0 | 13.1 | -3.3 | 52 |
| 10 | 5 | 29 | 1.6 | 3.1 | 246 | 6.5 | 14.7 | -2.6 | 53 |
| 11 | 9 | 28 | 2.3 | 4.6 | 259 | 8.3 | 17.3 | -0.5 | 53 |
| 12 | 4 | 23 | 2.8 | 6.2 | 233 | 1.8 | 5.2 | -0.9 | 68 |
| 13 | 2 | 12 | 3.8 | 6.3 | 225 | 5.4 | 11.7 | -0.9 | 46 |
| 14 | 5 | 21 | 4.0 | 6.2 | 200 | 7.6 | 13.7 | 2.8 | 58 |
| 15 | 2 | 12 | 1.5 | 2.5 | 332 | 7.1 | 14.3 | 0.2 | 55 |
| 16 | 9 | 31 | 1.6 | 3.0 | 122 | 10.5 | 20.4 | -0.4 | 47 |
| 17 | 8 | 30 | 2.7 | 4.9 | 232 | 15.9 | 24.8 | 7.3 | 37 |
| 18 | 14 | 79 | 2.5 | 5.8 | 213 | 18.0 | 28.1 | 7.6 | 39 |
| 19 | 20 | 67 | 3.9 | 8.4 | 208 | 15.1 | 25.5 | 5.5 | 40 |
| 20 | 5 | 18 | 3.0 | 5.7 | 294 | 8.0 | 12.8 | -0.7 | 37 |
| 21 | 9 | 36 | 1.6 | 2.5 | 67 | 8.1 | 18.1 | -3.1 | 42 |
| 22 | 8 | 25 | 1.7 | 4.0 | 352 | 10.8 | 20.5 | -1.4 | 45 |
| 23 | 10 | 26 | 1.9 | 4.4 | 174 | 14.7 | 23.8 | 3.1 | 48 |
| 24 | 5 | 17 | 1.3 | 3.0 | 338 | 10.4 | 14.4 | 7.0 | 83 |
| 25 | NO DATA | NO DATA | 1.5 | 3.5 | 133 | 10.9 | 18.7 | 4.2 | 67 |
| 26 | NO DATA | NO DATA | 2.0 | 4.0 | 219 | 13.2 | 21.7 | 4.2 | 53 |
| 27 | 0 (9) | 6 | 2.3 | 5.1 | 245 | 13.9 | 22.7 | 4.6 | 49 |
| 28 | 6 | 27 | 2.3 | 4.9 | 251 | 16.0 | 25.4 | 5.7 | 45 |
| 29 | 9 | 33 | 1.7 | 3.8 | 221 | 15.7 | 25.6 | 7.2 | 58 |
| 30 | 4 | 15 | 1.7 | 3.1 | 193 | 17.6 | 24.8 | 10.0 | 54 |
| 31 | 7 | 24 | 2.6 | 4.9 | 251 | 17.4 | 24.9 | 10.1 | 42 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds
(9) Negative value detected, zero reported

**WARM SPRINGS DAILY DATA SUMMARY - JUNE 2009**

**(Midnight to Midnight, Mountain Standard Time)**

| Day | (a) Average Concentration (ug/m3) | (a) Maximum Concentration (ug/m3) | Average Wind Speed (m/s) | Maximum Wind Speed (m/s) | Resultant Wind Direction (degrees) (b) | Average Temperature (deg C) | Maximum Temperature (deg C) | Minnimum Temperature (deg C) | Average Relative Humidity (percent) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 8 | 31 | 2.6 | 4.7 | 338 | 9.9 | 12.1 | 7.9 | 60 |
| 2 | 5 | 12 | 1.6 | 2.1 | 298 | 9.5 | 11.9 | 7.3 | 65 |
| 3 | 3 | 12 | 1.2 | 2.2 | 252 | 13.5 | 21.7 | 4.5 | 58 |
| 4 | 7 | 22 | 1.4 | 2.3 | 200 | 13.2 | 19.4 | 6.3 | 69 |
| 5 | 9 | 48 | 1.2 | 2.5 | 274 | 13.6 | 21.4 | 9.8 | 73 |
| 6 | 5 | 46 | 2.1 | 4.1 | 353 | 5.4 | 10.0 | 1.8 | 77 |
| 7 | 2 | 16 | 1.8 | 3.2 | 339 | 5.6 | 10.7 | 1.8 | 64 |
| 8 | 4 | 24 | 1.4 | 3.0 | 354 | 5.4 | 11.3 | 0.2 | 78 |
| 9 | 4 | 38 | 1.2 | 2.1 | 1 | 8.6 | 15.6 | 1.9 | 65 |
| 10 | 4 | 17 | 1.3 | 2.2 | 358 | 11.3 | 18.8 | 0.9 | 57 |
| 11 | 6 | 22 | 1.3 | 2.2 | 346 | 12.6 | 20.7 | 3.2 | 53 |
| 12 | 8 | 29 | 1.7 | 3.5 | 149 | 14.5 | 22.8 | 4.4 | 48 |
| 13 | 6 | 26 | 1.6 | 2.6 | 200 | 15.2 | 23.1 | 7.6 | 54 |
| 14 | 4 | 13 | 1.7 | 2.7 | 186 | 14.3 | 20.4 | 10.0 | 67 |
| 15 | 4 | 16 | 1.0 | 1.4 | 119 | 12.8 | 16.7 | 9.1 | 81 |
| 16 | 12 | 50 | 1.0 | 3.1 | 341 | 14.4 | 22.5 | 6.1 | 70 |
| 17 | 7 | 24 | 1.5 | 3.6 | 213 | 14.5 | 20.2 | 10.4 | 69 |
| 18 | 4 | 16 | 1.0 | 2.6 | 25 | 12.3 | 18.8 | 5.8 | 70 |
| 19 | 7 | 20 | 2.1 | 4.2 | 205 | 13.9 | 21.0 | 7.4 | 64 |
| 20 | 3 | 17 | 0.9 | 1.2 | 277 | 10.7 | 12.5 | 9.3 | 83 |
| 21 | 3 | 19 | 1.5 | 2.7 | 318 | 12.7 | 19.3 | 7.8 | 74 |
| 22 | 1 | 16 | 2.5 | 5.3 | 249 | 8.9 | 13.2 | 4.1 | 65 |
| 23 | 3 | 13 | 1.8 | 3.1 | 191 | 12.2 | 22.5 | 1.8 | 54 |
| 24 | 9 | 78 | 2.7 | 4.7 | 199 | 17.3 | 26.8 | 5.4 | 46 |
| 25 | 9 | 21 | 1.7 | 3.0 | 36 | 19.2 | 26.8 | 8.3 | 43 |
| 26 | 8 | 27 | 1.8 | 4.7 | 318 | 13.7 | 22.4 | 4.4 | 37 |
| 27 | 9 | 32 | 2.0 | 3.7 | 258 | 14.8 | 22.9 | 6.1 | 30 |
| 28 | 15 | 190 | 2.2 | 3.2 | 218 | 19.1 | 28.5 | 8.9 | NO DATA |
| 29 | 10 | 32 | 1.3 | 2.0 | 13 | 18.5 | 28.1 | 7.9 | 37 |
| 30 | 10 | 32 | 1.4 | 2.3 | 4 | 17.8 | 26.8 | 7.0 | 47 |

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

# APPENDIX B

# DUST SAMPLE MEMORANDA

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**MEMORANDUM – Opportunity / Warm Springs Settled Dust Sampling Events – Rev 1**
**Sampling Periods: March 2 – June 1, 2009 and June 1 – July 10, 2009**

**Submitted by Steve Heck, Blacktail Consulting, Inc.**

**September 16, 2009**

***This memorandum describes the preliminary results of settled dust sampling conducted at the Opportunity and Warm Springs air monitoring sites on behalf of Kuipers and Associates, and Anaconda-Deer Lodge County. All data, discussion and conclusions provided in this report are preliminary and will undergo a complete quality assurance review prior to issuance of final results in quarterly and annual reports in accordance with the project Sampling and Analysis Plan.***

## 1. SAMPLE COLLECTION

On March 2, 2009, clean 9-inch diameter glass dishes were set out at both sites at a height of approximately 7 feet to capture and retain settling dust. A personal sampling pump supplied by SKC, Inc. was used to vacuum any settled dust from the dishes during twice-weekly site visits. Vacuuming could not be performed when standing water was present. In those instances, the water was allowed to evaporate, and vacuuming was performed at the next opportunity.

The vacuumed dust was collected onto 37-mm diameter, matched weight mixed cellulose ester (MCE) filter cassettes. The filters were recommended by the manufacturer for applications involving trace element analyses. The matched filter weights allow one to avoid filter pre-weighing. The total dust determination is made by simply weighing the two filters following sampling; the difference in their weights equals the mass of dust collected.

The glass dishes were vacuumed for the last time on June 1, 2009, and the cassettes were submitted to the MSE Laboratory for analysis. Both samples were weighed to determine the total amount of particulate collected. Samples having a sufficient net dust mass (≥ 1.0 mg) were analyzed for arsenic, cadmium, copper, lead and zinc.

A second set of dust samples was collected over the period of June 1 – July 10, 2009, in the manner described above.

## 2. ANALYTICAL PROCEDURES

Following weighing, exposed filters were digested using Method SW-846 3050B for soils, and analyzed for trace metals by ICP Mass Spectrometer (ICP-MS) using Method SW-846 6020A. Additionally, a blank filter cassette was analyzed to provide background concentrations for the MCE filters.

## 3. ANALYTICAL RESULTS

Table 1 presents settled dust trace element results for the samples collected between March 2 and June 1. Table 2 presents results for the samples collected between June 1 and July 10.

### 3.1 Filter Weights

The filters were weighed on an enclosed balance with a resolution of 0.0001 grams (0.1 mg). Results are shown in Section A of Tables 1 and 2. The "Tare" filter weight is the weight of the unexposed matched weight filter, and the "Exposed" weight is the weight of the filter dust was collected on. The net dust weight is calculated as the difference between these values.

For the first set of samples, the mass of dust collected on the Opportunity filter was 35.5 mg, while the dust mass on the Warm Springs filter was 9.3 mg. These are the largest particulate masses collected from the glass dish sampling to date.

For the second set of samples, the respective dust masses were 12.0 mg at Opportunity and 1.6 mg at Warm Springs.

The two matched weight filters from the blank cassette also were weighed, and the difference in their weights was found to be 0.2 mg.

### 3.2 Trace Element Results

The trace element results are presented in Section B of Tables 1 and 2. The "Total" results represent the trace element concentrations in the exposed filter – which includes contributions from both the filter material and the collected dust. A blank filter was analyzed for trace elements, with results shown in the column labeled "Blank." Next, net filter trace element concentrations were calculated by subtracting the blank values from the total values. The net results represent the average trace element concentrations throughout the filter based solely on the contribution from the collected dust.

### 3.3. Trace Element Concentrations in Dust

The net trace element concentrations in Section B are for the entire exposed filter mass. Trace element concentrations in the collected dust were calculated using the net trace element results,

the exposed filter weight and the collected dust weight. For the first sample set for the Opportunity site, the net dust weight was 0.0355 grams, while the total weight of the exposed MCE filter was 0.0862 grams. The following example illustrates the calculation used to determine trace element concentrations in the collected dust:

- Concentration of arsenic over the entire exposed filter was 66.6 mg/kg. Therefore, the amount of arsenic present was 66.6 mg/kg x 0.0862 g, or $5.741 \times 10^{-3}$ mg.
- Because all of this net arsenic concentration was contained in the dust portion, the arsenic concentration in dust was $5.741 \times 10^{-3}$ mg / 0.0355 g, or 162 mg/kg.

The concentrations of other trace elements in the dust were calculated using the same approach. Results are summarized in Section C of Tables 1 and 2.

Disassembly and weighing of the filter cassettes proceeded smoothly for these samples, and no analytical issues were encountered.

## 4. RECOMMENDATIONS FOR FUTURE SAMPLING AND ANALYSIS

The laboratory analysis proceeded smoothly for these filters. For the first set of filters the dust masses collected were sufficient for reliable trace element determinations. For the second set the mass was sufficient for the Opportunity sample. However, at Warm Springs the arsenic concentration was below the mass-adjusted laboratory reporting limit. For all other analytes the concentrations were at least five times greater than the reporting limit.

Recently, three additional glass dishes were installed at both sites, which will effectively quadruple the amount of particulate collected. This will be particularly helpful during the winter months, when airborne particulate levels tend to decrease significantly from summertime levels.

Currently, duplicate samples are being collected at the Opportunity site to provide a measure of method precision. This is being done by vacuuming dust from the dishes into separate filter cassettes (i.e., two dishes are being vacuumed into each cassette).

## TABLE 1 - OPPORTUNITY / WARM SPRINGS SETTLED DUST SAMPLE RESULTS
## (Sampling conducted 3-2-2009 through 6-1-2009)

### A. Filter Weight Data

| | |
|---|---|
| Opportunity Analyzed Filter Weight (g) | 0.0862 |
| Opportunity Tare Filter Weight (g) | 0.0507 |
| Opportunity Net Particulate Weight (g) | 0.0355 |
| | |
| Warm Springs Analyzed Filter Weight (g) | 0.0574 |
| Warm Springs Tare Filter Weight (g) | 0.0481 |
| Warm Springs Net Particulate Weight (g) | 0.0093 |

### B. Trace Element Results

| | ***Opportunity*** | | | ***Warm Springs*** | | | ***Blank*** (1) |
|---|---|---|---|---|---|---|---|
| ***Analyte*** | Total Filter Conc. (mg/kg) | Net Filter Conc. (mg/kg) | Reporting Limit (mg/kg) | Total Filter Conc. (mg/kg) | Net Filter Conc. (mg/kg) | Reporting Limit (mg/kg) | Average Conc. (mg/kg) |
| ***As*** | 66.6 | 66.6 | 0.870 | 12.1 | 12.1 | 1.31 | ND |
| ***Cd*** | 2.07 | 2.07 | 0.058 | 0.951 | 0.951 | 0.087 | ND |
| ***Cu*** | 232 | 232 | 0.725 | 62.4 | 61.9 | 1.09 | 0.456 |
| ***Pb*** | 59.4 | 59.2 | 0.116 | 21.0 | 20.8 | 0.174 | 0.158 |
| ***Zn*** | 282 | 260 | 1.74 | 124 | 102 | 2.61 | 22.1 |

*(1) Blank concentration based on unexposed filter*

### C. Calculated Trace Element Concentrations in Particulate

| | ***Opportunity*** | | | ***Warm Springs*** | | |
|---|---|---|---|---|---|---|
| ***Analyte*** | Net Filter Conc. (mg/kg) | ***Net Particulate Conc. (mg/kg)*** | (1) Reporting Limit (mg/kg) | Net Filter Conc. (mg/kg) | ***Net Particulate Conc. (mg/kg)*** | (1) Reporting Limit (mg/kg) |
| ***As*** | 66.6 | ***162*** | 2.11 | 12.1 | ***74.7*** | 8.09 |
| ***Cd*** | 2.07 | ***5.03*** | 0.141 | 0.951 | ***5.87*** | 0.537 |
| ***Cu*** | 231.544 | ***562*** | 1.76 | 61.9 | ***382*** | 6.73 |
| ***Pb*** | 59.242 | ***144*** | 0.282 | 20.8 | ***129*** | 1.07 |
| ***Zn*** | 259.9 | ***631*** | 4.23 | 102 | ***629*** | 16.1 |

*(1) Reporting Limit adjusted to reflect mass of particulate collected*

## TABLE 2 - OPPORTUNITY / WARM SPRINGS SETTLED DUST SAMPLE RESULTS
## (Sampling conducted 6-1-2009 through 7-10-2009)

### A. Filter Weight Data

| | |
|---|---|
| Opportunity Analyzed Filter Weight (g) | 0.0618 |
| Opportunity Tare Filter Weight (g) | 0.0498 |
| Opportunity Net Particulate Weight (g) | 0.0120 |
| | |
| Warm Springs Analyzed Filter Weight (g) | 0.0502 |
| Warm Springs Tare Filter Weight (g) | 0.0486 |
| Warm Springs Net Particulate Weight (g) | 0.0016 |

### B. Trace Element Results

| | *Opportunity* | | | *Warm Springs* | | | *Blank* (1) |
|---|---|---|---|---|---|---|---|
| *Analyte* | Total Filter Conc. (mg/kg) | Net Filter Conc. (mg/kg) | Reporting Limit (mg/kg) | Total Filter Conc. (mg/kg) | Net Filter Conc. (mg/kg) | Reporting Limit (mg/kg) | Conc. (mg/kg) |
| ***As*** | 29.7 | 29.7 | 1.21 | 0.941 | 0.941 | 1.49 | ND |
| ***Cd*** | 0.854 | 0.854 | 0.081 | 0.504 | 0.504 | 0.100 | ND |
| ***Cu*** | 94.2 | 93.7 | 1.01 | 7.18 | 6.72 | 1.25 | 0.456 |
| ***Pb*** | 24.5 | 24.3 | 0.162 | 3.11 | 2.95 | 0.199 | 0.158 |
| ***Zn*** | 114 | 91.9 | 2.43 | 33.8 | 11.7 | 2.99 | 22.1 |

*(1) Blank concentration based on unexposed filter*

### C. Calculated Trace Element Concentrations in Particulate

| | *Opportunity* | | | *Warm Springs* | | |
|---|---|---|---|---|---|---|
| *Analyte* | Net Filter Conc. (mg/kg) | ***Net Particulate Conc. (mg/kg)*** | (1) Reporting Limit (mg/kg) | Net Filter Conc. (mg/kg) | ***Net Particulate Conc. (mg/kg)*** | (1) Reporting Limit (mg/kg) |
| ***As*** | 29.7 | ***153*** | 6.23 | 0.941 | ***29.5*** | 46.7 |
| ***Cd*** | 0.854 | ***4.40*** | 0.417 | 0.504 | ***15.8*** | 3.14 |
| ***Cu*** | 93.7 | ***483*** | 5.20 | 6.72 | ***211*** | 39.2 |
| ***Pb*** | 24.3 | ***125*** | 0.834 | 2.95 | ***92.6*** | 6.24 |
| ***Zn*** | 91.9 | ***473*** | 12.51 | 11.7 | ***367*** | 93.8 |

*(1) Reporting Limit adjusted to reflect mass of particulate collected*

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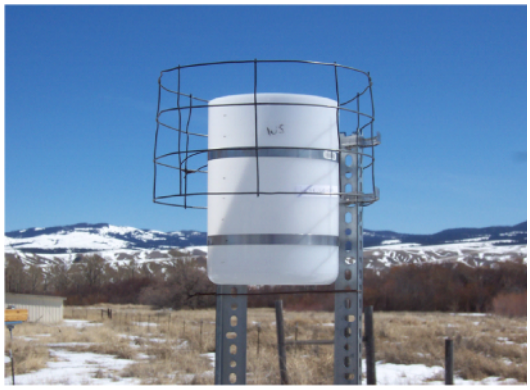
**MEMORANDUM – Opportunity / Warm Springs Dustfall Sampling Events – Rev 1**
**Sampling Periods: March 2 - April 5, 2009 and April 5 – June 1, 2009**

**Submitted by Steve Heck, Blacktail Consulting, Inc.**

**September 1, 2009**

***This memorandum describes the preliminary results of dustfall sampling conducted at the Opportunity and Warm Springs air monitoring sites on behalf of Kuipers and Associates, and Anaconda-Deer Lodge County. All data, discussion and conclusions provided in this report are preliminary and will undergo a complete quality assurance review prior to issuance of final results in quarterly and annual reports in accordance with the project Sampling and Analysis Plan. Analytical method development has continued, due to issues with isopropyl alcohol contamination described herein.***

## 1. Sample Collection



On March 2, 2009, clean 6.75 inch diameter by 8.75 inch tall Nalgene, polypropylene dustfall jars were installed at both sites at a height of approximately 8 feet to capture and retain settling dust. The jars were de-contaminated by the laboratory prior to use by cleaning them with laboratory soap, then rinsing them with nitric acid and deionized water. The jars were initially filled to a depth of 2 inches with deionized water (DI $H_2O$). The jars were inspected during twice-weekly site visits; DI $H_2O$ was added as necessary to maintain a liquid level of at least an inch. At the end of the sampling period on April 5, 2009, the jars were covered with clean lids, and transported to the MSE laboratory for analysis. A field blank was also prepared by partially filling a clean jar with DI $H_2O$.

Another set of jars was installed on April 5, 2009 and retrieved on June 1, 2009. They were filled and maintained in an identical manner.

## 2. Analytical Procedures

After delivery to the laboratory, the dustfall jar contents were transferred into 2,000 mL beakers, which then were covered with watchglasses and evaporated in a convection oven at a temperature of 90 to 105ºC. After the liquid evaporated down to approximately 100-200 mL, the contents were transferred to pre-weighed 200-mL beakers and evaporated to dryness. The beakers then were weighed to within 0.0001 grams to determine a net particulate residue weight. The residue was digested using SW-846 Method 3050B for soils, and analyzed for trace metals by ICP Mass Spectrometer (ICP-MS) using Method SW-846 6020A.

## 3. Raw Analytical Results

The raw analytical results are presented in Part A of Table 1 (for the first set of samples) and Table 2 (for the second set of samples). They show the trace element concentrations in the liquid as received by the laboratory, the volume of liquid initially evaporated, and the net weight of solids after evaporation.

The total trace element mass in each sample was calculated by multiplying the concentration in the sample liquid by the volume of liquid as received by the laboratory. Those results are shown in Part B of Tables 1 and 2.

## 4. Trace Element Concentrations in Dustfall Particulate

The trace element concentrations in the collected particulate were calculated by dividing the trace element weights by the total amount of particulate collected in each sample. Results are shown in Part C of Tables 1 and 2. The results for these samples were of the same magnitude as for previous glass dish dust samples, and were similar to values previously calculated from ARCO's South sampler trace element results. However, a large variance was noted for the duplicate samples collected at Opportunity. This could be due to non-uniformity in the particulate, particularly during blowing dust episodes (although it can't be stated that such episodes occurred during the sampling period). Also, because the total amounts of particulate captured during the sampling period were quite small (5.4 mg and 3.5 mg for the duplicate samples), any other materials captured by the jars (such as windblown vegetation matter or insects) would have a significant impact.

Preliminary particulate concentrations for arsenic and lead can be summarized as follows:

| Sampling Period | Opportunity (mg/kg) | | Warm Springs (mg/kg) | |
|---|---|---|---|---|
| | As | Pb | As | Pb |
| 3/2/2009 – 4/5/2009 | 122 | 31.7 | 140 | 49.7 |
| 3/2/2009 – 4/5/2009 (Duplicate) | 268 | 107 | N/A | N/A |
| 4/5/2009 – 6/1/2009 | 148 | 101 | 83.3 | 88.1 |

## 5. Calculation of Total Dustfall Rate

Dustfall is expressed in units of $g/m^2$/month, and is calculated by dividing the mass of particulate collected by the cross-sectional area of the dustfall jar, and dividing that result by the number of days the sample was collected over. With a diameter of 6.75 inches, the dustfall jars have a cross-sectional area of 35.78 $in^2$, or 0.0231 $m^2$. The calculated dustfall rates were as follows:

| Sampling Period | Opportunity | | Warm Springs | |
|---|---|---|---|---|
| | $g/m^2$ | $g/m^2$/month (1) | $g/m^2$ | $g/m^2$/month (1) |
| 3/2/2009 – 4/5/2009 | 0.23 | 0.21 | 0.10 | 0.08 |
| 3/2/2009 – 4/5/2009 (Duplicate) | 0.15 | 0.13 | N/A | N/A |
| 4/5/2009 – 6/1/2009 | 1.80 | 0.95 | 0.93 | 0.49 |
| (1) Dustfall rate based on 30-day month. | | | | |

The values for the first set of samples are basically at or below the method's stated detection limit of 0.2 $g/m^2$/month. While the mass of particulate for the second set of samples was much greater, the calculated dustfall rates were still very low compared to the Montana settleable particulate standard of 10 $g/m^2$/month.

## 6. Recommendations for Future Sampling and Analysis

The new evaporation and weighing procedure (implemented in January 2009) provides much better mass resolution –less than one mg, versus as much as 0.02-0.03 g (20-30 mg) previously. Additionally, the use of isopropyl alcohol was discontinued beginning with the samples discussed herein, due to trace element contamination issues.

Although current sampling procedures are providing better results, a new concern has arisen. Since late spring, the jars have trapped numerous flying insects, which makes an accurate particulate weight determination virtually impossible. The next set of jars (installed from June 1 to July 10, 2009) was not analyzed for that reason. Trapping of insects will likely be an issue until the first killing frost arrives, typically in early September.

**TABLE 1 -- SUMMARY OF OPPORTUNITY / WARM SPRINGS DUSTFALL RESULTS**
**(Samples collected from 3-2-2009 to 4-5-2009)**

**A. Analytical Results**

| Analyte | Opportunity-A (ug/L) | Opportunity-B (ug/L) | Warm Springs (ug/L) |
|---|---|---|---|
| As | 0.462 | 0.625 | 0.222 |
| Cd | 0.040 | 0.072 | 0.045 |
| Cu | 1.41 | 1.34 | 0.949 |
| Pb | 0.120 | 0.249 | 0.079 |
| Zn | 9.20 | 6.95 | 5.16 |
| | | | |
| Sample Volume (mL) | 1425 | 1498 | 1385 |
| Solids Weight (mg) | 5.4 | 3.5 | 2.2 |
| Solids (mg/L) | 3.8 | 2.3 | 1.6 |
| ND = Not Detected; NA = Not Applicable | | | |

**B. Trace Element Weight**

| Analyte | Opportunity-A Total (ug) | Opportunity-B Total (ug) | Warm Springs Total (ug) |
|---|---|---|---|
| As | 0.658 | 0.936 | 0.307 |
| Cd | 0.057 | 0.108 | 0.062 |
| Cu | 2.01 | 2.01 | 1.31 |
| Pb | 0.171 | 0.373 | 0.109 |
| Zn | 13.1 | 10.4 | 7.15 |

**C. Trace Element Concentrations in Particulate**

| Analyte | Opportunity-A mg/kg | Reporting Limit mg/kg | Opportunity-B mg/kg | Reporting Limit mg/kg |
|---|---|---|---|---|
| As | **122** | 13.9 | **268** | 21.4 |
| Cd | **10.6** | 0.926 | **30.8** | 1.43 |
| Cu | **372** | 11.6 | **574** | 17.9 |
| Pb | **31.7** | 1.85 | **107** | 2.86 |
| Zn | **2428** | 27.8 | **2975** | 42.9 |

| Analyte | Warm Springs mg/kg | Reporting Limit mg/kg |
|---|---|---|
| As | **140** | 34.1 |
| Cd | **28.3** | 2.3 |
| Cu | **597** | 28.4 |
| Pb | **49.7** | 4.5 |
| Zn | **3248** | 68.2 |

**TABLE 2 -- SUMMARY OF OPPORTUNITY / WARM SPRINGS DUSTFALL RESULTS**
**(Samples collected from 4-5-2009 to 6-1-2009)**

**A. Analytical Results**

| Analyte | Opportunity (ug/L) | Warm Springs (ug/L) | Field Blank (ug/L) |
|---|---|---|---|
| As | 9.26 | 2.96 | 0.027 |
| Cd | 0.351 | 0.300 | 0.025 |
| Cu | 28.7 | 11.1 | 0.199 |
| Pb | 6.35 | 3.13 | 0.049 |
| Zn | 44.7 | 24.5 | 1.50 |
| | | | |
| Sample Volume (mL) | 662 | 605 | 896 |
| Solids Weight (mg) | 41.5 | 21.5 | 0.2 |
| Solids (mg/L) | 62.7 | 35.5 | 0.2 |
| ND = Not Detected; NA = Not Applicable | | | |

**B. Trace Element Weight**

| Analyte | Opportunity Total (ug) | Warm Springs Total (ug) | Field Blank Total (ug) |
|---|---|---|---|
| As | 6.13 | 1.79 | 0.024 |
| Cd | 0.232 | 0.182 | 0.022 |
| Cu | 19.0 | 6.72 | 0.178 |
| Pb | 4.20 | 1.89 | 0.044 |
| Zn | 29.6 | 14.8 | 1.34 |

**C. Trace Element Concentrations in Particulate**

| Analyte | Opportunity mg/kg | Reporting Limit mg/kg | Warm Springs mg/kg | Reporting Limit mg/kg |
|---|---|---|---|---|
| As | **148** | 1.81 | **83.3** | 3.49 |
| Cd | **5.60** | 0.120 | **8.44** | 0.233 |
| Cu | **458** | 1.51 | **312** | 2.91 |
| Pb | **101** | 0.241 | **88.1** | 0.465 |
| Zn | **713** | 3.61 | **689** | 6.98 |

# APPENDIX C

## E-BAM PERFORMANCE CHECK / MAINTENANCE PROCEDURES SECOND QUARTER 2009

## 1.1 Performance Check / Maintenance Procedures

### 1.1.1 E-BAM Sampler

Several checks are performed on the E-BAM sampler, including both its particulate monitoring system and the internal barometric pressure sensor.

#### *1.1.1.1 Leak Check (E-BAM Manual Section 2.4.1.1)*

Each month, the E-BAM sampler is checked for leaks in the sampling train that could compromise data integrity. This check is performed by installing a BX-302 valve/filter assembly in place of the sampling inlet, and running the sampler in its "pump test" mode while slowly closing the valve. The check is considered satisfactory if the flow drops to below 1.5 LPM.

#### *1.1.1.2 Operating Flow Rate Check (E-BAM Manual Section 2.4.1.5)*

The operating flow rate check is performed monthly by installing an NIST-traceable BGI Delta-Cal flow monitor in place of the sampling inlet, and comparing the indicated flow against the target of 16.7 LPM. The check is considered satisfactory if the indicated flow is within +/- 2% of the target value. Otherwise, the flow is adjusted at set points of 14.0 LPM and 17.5 LPM, and the operating flow re-checked.

A successful operating flow rate check, when preceded by a successful leak check, proves that the E-BAM sampler is collecting valid $PM_{10}$ data.

#### *1.1.1.3 Pump Test (E-BAM Manual Section 2.4.1.7)*

This test was discontinued during the second quarter of 2009, because experience has shown it to be of little value for indicating when a pump is nearing the end of its operating life.

#### *1.1.1.4 Zero/Span Check (E-BAM Manual Section 2.4.3.1)*

Zero and span membrane plates supplied with each sampler are used quarterly to check the calibration of the E-BAM sampler's beta attenuation detector (The manual indicates this check is not required until after 6 months of operation). These plates simulate specific particulate loads when used in conjunction with a blank filter tape. The checks are performed within the E-BAM sampler's "membrane test" menu, which directs the user to install and remove the plates at specified times. At the conclusion of the test, the display screen indicates whether the calibration test was successful. The membrane plates are certified by the manufacturer.

#### *1.1.1.5 Clean Valve and Nozzle (E-BAM Manual Section 2.4.5)*

The sampler's sample inlet nozzle (located directly above the filter tape) and vane (located directly beneath the filter tape) are cleaned monthly with a modified Q-tip using isopropyl alcohol. Care is taken that no excess alcohol drips into the vane assembly, which could affect

the unit's calibration. Immediately after performing this maintenance, the leak check described in Section 1.1.1.1 is repeated to ensure that the sample train integrity was not compromised.

*1.1.1.6 Clean $PM_{10}$ Inlet (E-BAM Manual Appendix H)*

Each month the $PM_{10}$ inlet is removed from the sampler, disassembled and cleaned using paper towels and isopropyl alcohol. Additionally, all o-rings are lubricated with stopcock grease as necessary.

*1.1.1.7 Barometric Pressure Sensor Check (E-BAM Manual Section 2.4.1.4)*

The E-BAM's internal barometer is checked monthly using a Wallace and Tiernan aneroid barometer that is routinely checked against a mercury wall barometer. If the results agree within +/- 2 mmHg, no adjustment is necessary.

1.1.2 Meteorological Sensors

*1.1.2.1 Temperature (E-BAM Manual Section 2.4.1.3)*

The E-BAM manual specifies a two-point calibration procedure using an ambient temperature and an ice bath. However, the manufacturer indicated that a single-point field calibration check was generally sufficient. Disassembly of the sensor for placement in an ice bath is not trivial, and is impractical as a routine field activity.

The temperature sensor is checked monthly at ambient conditions using an Assmann Psychrometer that has been certified against an NIST-traceable mercury thermometer. If the readings agree to within 0.5 degrees Celsius, no adjustment is necessary.

*1.1.2.2 Relative Humidity (Model 593 Relative Humidity Sensor Operation Manual)*

The Model 593 Manual indicates that recalibration (requiring additional specialized equipment) is required only if the sensor element is replaced in the field. For this project, calibration of the relative humidity sensor will be limited to monthly collocated checks using an Assmann Psychrometer that is certified against an NIST-traceable mercury thermometer. Wet-bulb and dry-bulb temperatures, together with ambient barometric pressure, are used with psychrometric tables to calculate a true relative humidity, which is compared against the E-BAM display. If the indicated relative humidity agrees with that obtained by the Assmann psychrometer to within +/- 5% relative humidity, the results are considered acceptable. If consistently unacceptable results are obtained, the relative humidity sensor will be returned to the manufacturer for re-calibration and/or repair.

*1.1.2.3 Wind Speed (Model 034B Wind Sensor Operation Manual)*

The Model 034B Manual recommends an initial check of the unit's response to a known rotation rate. This is being done monthly in the field using a 300 rpm synchronous motor to produce a known wind speed of 18.49 mph (8.27 m/s). The manual specifies an accuracy of +/- 0.25 mph

(0.11 m/s) at speeds below 22.7 mph (10.1 m/s). Additionally, the response of the sensor when stopped is observed; it should be 0.3 +/- 0.1 m/s.

*1.1.2.4 Wind Direction (Model 034B Wind Sensor Operation Manual)*

The manual does not specify routine checks for the wind direction sensor, beyond an initial check to confirm that the sensor's readout increases from 0 to 360 degrees as the shaft is turned clockwise. However, routine checks are performed monthly to verify proper operation. First, the sensor's alignment is verified by locking the sensor in place with its alignment pin, and ensuring that a response of between 178 and 182 degrees is obtained. Next, the sensor's linearity is verified by turning it in 90-degree intervals (using the sensor crossarm as a visual reference), and confirming that the E-BAM display's direction indication changes by 90 +/- 3 degrees with each step.

The initial orientation of the sensor was performed using a solar sighting in conjunction with NIST time (WWV) to establish precise direction azimuths. The use of solar sightings – rather than magnetic compass readings – negates any localized magnetic influences.

*1.1.2.5 Filter Temperature and Humidity (E-BAM Manual Sections 2.4.2.1 and 2.4.2.2)*

The E-BAM Manual includes provisions for adjusting the response of both of these parameters. However, there is no practical way to accurately check either parameter with an external reference standard. Therefore, checks of these parameters will be limited to review of downloaded data files for suspicious behavior.

**1.2 Performance Check Results**

Each set of performance check results is presented in Appendix D. Results obtained during the Second Quarter of 2009 were satisfactory

# APPENDIX D

# E-BAM PERFORMANCE CHECK RESULTS

## OPPORTUNITY SITE

| | | | | |
|---|---|---|---|---|
| | DATE | 4/5/2009 | 4/27/2009 | 5/27/2009 |
| | INITIALS | SH | SH | SH |
| | EBAM OFF-LINE@ | 1502 MST | NA | 1618 MST |
| | EBAM BACK ON-LINE@ | 1546 MST | NA | 1655 MST |
| | | Monthly checks | Monthly checks | Monthly checks |
| **METEOROLOGICAL PARAMETERS** | | | | |
| Ambient Temperature (+/- 1 deg C) | EBAM-Indicated | 8.1 | | 20.8 |
| | Audit | 7.2 | | 20.4 |
| Ambient RH Check (+/- 5% RH) | EBAM-Indicated | 29% | | 28% |
| | Audit (Td/Tw) | 7.2 / 0.9 | | 20.4 / 9.5 |
| | Audit RH | 29.7% | | 24.5% |
| Wind Speed Response (0.2-0.4 m/s stopped) | EBAM-Stopped | | 0.3 | 0.3 |
| | EBAM-Spinning | | 3.2 | 2.5 |
| Wind Speed - motor (+/- 0.1 m/s) | EBAM-Indicated | | 8.3 | 8.3 |
| | Known | | 8.27 | 8.27 |
| Ambient BP Check (+/- 2 mm Hg) | EBAM-Indicated | 641.8 | | 635.4 |
| | Audit | 642 | | 635 |
| Wind Direction Orientation (178 - 182 deg) | EBAM-Indicated (with pin locked) | | 180 | 179-180 |
| Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity) | Along crossarm | | 155 | 156 |
| | +90 degrees | | 244 | 245 |
| | +180 degrees | | 336 | 336 |
| | +270 degrees | | 66 | 66 |
| | +360 degrees | | 154 | 155 |
| **EBAM SAMPLER** | | | | |
| Leak Check (see 2.4.1.1) (Allowed <1.5 LPM) | Result | 0.9 LPM | | 0.8 LPM |
| | Leak repaired? | NA | | NA |
| Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03) | As found | 16.81 | | 16.52 |
| | As left (if recalibrated) | NA | | 16.66 |
| Flow Calibration - Low Flow (if necessary) | As found | NA | | 13.82 |
| | As left | NA | | 14.03 |
| Flow Calibration - High Flow (if necessary) | As found | NA | | 17.27 |
| | As left | NA | | 17.46 |
| Clean Nozzle (see 2.4.5) | Confirm (X) | X | | X |
| Clean PM-10 Inlet (Appdx H) | Confirm (X) | X | | X |
| Zero/Span Verification (Quarterly - see 2.4.3.1) | Zero Pass/Fail | 0.345 (Pass) | | NA |
| | Span Pass/Fail | 0.938 (Pass) | | NA |
| Confirm Leak Check (after maintenance) | Result | 0.9 LPM | | 0.8 LPM |
| | Leak repaired? | NA | | NA |

| | | |
|---|---|---|
| **Audit and Calibration Standards** | ***Wind Speed:*** | 300 RPM synchronous motor |
| | ***Temp / RH:*** | Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085 |
| | ***Bar. Pressure:*** | W & T Model FA185260, S/N LL03297; Delta Cal S/N 498 |
| | ***Wind Direction:*** | Initially oriented using solar sighting |
| | ***EBAM Flows etc.:*** | BGI Delta Cal, S/N 498 |

## WARM SPRINGS SITE

| | | | | |
|---|---|---|---|---|
| | DATE | 4/5/2009 | 4/27/2009 | 5/27/2009 |
| | INITIALS | SH | SH | SH |
| | EBAM OFF-LINE@ | 1302 MST | NA | 1402 MST |
| | EBAM BACK ON-LINE@ | 1356 MST | NA | 1550 MST |
| | | Monthly checks | Monthly checks | Monthly checks |
| **METEOROLOGICAL PARAMETERS** | | | | |
| Ambient Temperature | EBAM-Indicated | 6.6 | | 21.4 (A) |
| (+/- 1 deg C) | Audit | 5.8 | | 22.6 |
| Ambient RH Check | EBAM-Indicated | 32% | | 23% |
| (+/- 5% RH) | Audit (Td/Tw) | 5.8 / 0.1 | | 22.6 / 10.3 |
| | Audit RH | 32.2% | | 20.9% |
| Wind Speed Response | EBAM-Stopped | | 0.3 | 0.3 |
| (0.2-0.4 m/s stopped) | EBAM-Spinning | | 1.5 | 4.0 |
| Wind Speed - motor | EBAM-Indicated | | 8.3 | 8.3 |
| (+/- 0.1 m/s) | Known | | 8.27 | 8.27 |
| Ambient BP Check | EBAM-Indicated | 645.2 | | 638.5 |
| (+/- 2 mm Hg) | Audit | 645 | | 638 |
| Wind Direction Orientation | EBAM-Indicated | | 179 | 179 |
| (178 - 182 deg) | (with pin locked) | | | |
| Wind Direction Linearity | Along crossarm | | 190 | 191 |
| (referenced to crossarm) | +90 degrees | | 282 | 282 |
| (+/- 3 deg. linearity) | +180 degrees | | 12 | 11 |
| | +270 degrees | | 102 | 103 |
| | +360 degrees | | 190 | 191 |
| **EBAM SAMPLER** | | | | |
| Leak Check (see 2.4.1.1) | Result | 0.5 LPM | | <0.5 LPM |
| (Allowed <1.5 LPM) | Leak repaired? | NA | | NA |
| Operating Flow (see 2.4.1.5) | As found | 16.76 | | 16.77 |
| (Target 16.7 LPM, | As left | NA | | NA |
| allowed range 16.37-17.03) | (if recalibrated) | | | |
| Flow Calibration - Low Flow | As found | NA | | 14.03 |
| (if necessary) | As left | NA | | NA |
| Flow Calibration - High Flow | As found | NA | | 17.54 |
| (if necessary) | As left | NA | | NA |
| Clean Nozzle (see 2.4.5) | Confirm (X) | X | | X |
| Clean PM-10 Inlet (Appdx H) | Confirm (X) | X | | X |
| Zero/Span Verification | Zero Pass/Fail | 0.353 (Pass) | | NA |
| (Quarterly - see 2.4.3.1) | Span Pass/Fail | 0.965 (Pass) | | NA |
| Confirm Leak Check | Result | 0.5 LPM | | <0.5 LPM |
| (after maintenance) | Leak repaired? | NA | | NA |

| | | |
|---|---|---|
| **Audit and Calibration Standards** | ***Wind Speed:*** | 300 RPM synchronous motor |
| | ***Temp / RH:*** | Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085 |
| | ***Bar. Pressure:*** | W & T Model FA185260, S/N LL03297; Delta Cal S/N 498 |
| | ***Wind Direction:*** | Initially oriented using solar sighting |
| | ***EBAM Flows etc.:*** | BGI Delta Cal, S/N 498 |

(A) = Adjusted temperature response

# APPENDIX E

## AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES SECOND QUARTER 2009

**Opportunity Site April 2009** (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | -1 | -1 | 4 | 4 | 0 | 1 | 4 | 7 | -2 | 7 | -3 | 2 | -1 | -5 | 4 | BA | 11 | -1 | 5 | 1 | 0 | 2 | -5 | -1 | 23 | 1.4 |
| 2 | 3 | -1 | 0 | -3 | -2 | 1 | -4 | 5 | 3 | 6 | 6 | 1 | -3 | 1 | 24 | -5 | -5 | 4 | 6 | 19 | -5 | 9 | -5 | 18 | 24 | 3.0 |
| 3 | 10 | 11 | 18 | 0 | 11 | 20 | 6 | -5 | 1 | 4 | -2 | 16 | 1 | 6 | -5 | 4 | -1 | 2 | -1 | 5 | 4 | 3 | 2 | 6 | 24 | 4.8 |
| 4 | 3 | -5 | 3 | 24 | 14 | 12 | -1 | 3 | 0 | -3 | -1 | -4 | -5 | 0 | 0 | 1 | 8 | -5 | 3 | -2 | 10 | 21 | 15 | 15 | 24 | 4.4 |
| 5 | 25 | 7 | 20 | 19 | 5 | 9 | 6 | -2 | -3 | 8 | 5 | -5 | 12 | 0 | 7 | BA | -5 | 7 | 3 | 9 | 14 | 3 | 3 | -2 | 23 | 6.3 |
| 6 | 2 | -1 | 2 | 3 | 1 | -1 | -5 | 6 | 1 | 23 | 8 | 9 | 15 | 21 | 19 | 20 | 10 | 4 | 7 | 7 | 13 | -1 | 9 | 12 | 24 | 7.7 |
| 7 | 8 | 6 | 3 | 8 | 4 | 3 | -1 | 6 | 0 | 38 | 8 | 12 | 15 | 12 | 13 | 25 | 5 | 10 | 13 | 11 | 9 | 7 | 19 | 3 | 24 | 9.9 |
| 8 | 8 | 16 | 13 | 4 | 8 | 6 | 4 | 11 | 7 | 22 | 13 | 23 | 40 | 32 | 27 | 21 | 26 | 24 | 9 | 8 | 15 | 6 | 10 | 15 | 24 | 15.3 |
| 9 | 2 | 3 | 11 | 5 | 12 | 10 | 8 | 17 | 0 | 14 | 5 | -1 | 14 | 7 | 3 | 12 | 9 | 5 | 7 | 17 | 23 | 17 | 12 | 15 | 24 | 9.5 |
| 10 | 24 | 6 | 5 | 12 | 6 | 11 | 9 | -1 | 8 | 10 | 9 | 3 | 6 | 13 | 18 | -5 | 9 | 6 | 8 | 4 | 8 | 7 | 14 | 9 | 24 | 8.3 |
| 11 | 13 | 3 | 5 | -5 | 16 | 12 | 1 | 2 | 2 | 1 | 6 | 2 | 3 | 13 | 13 | 9 | 15 | 11 | 8 | 10 | 9 | -2 | -5 | 6 | 24 | 6.2 |
| 12 | -2 | 3 | 0 | 19 | 1 | 9 | -2 | 0 | 6 | 0 | 6 | 7 | 10 | 7 | 14 | 11 | 6 | 1 | 2 | 1 | 5 | 1 | 2 | -2 | 24 | 4.4 |
| 13 | -3 | 3 | 11 | 4 | 2 | 1 | -1 | 6 | 11 | 34 | 39 | -5 | -5 | 9 | 15 | 17 | 3 | 19 | 26 | 5 | 28 | 16 | 12 | -1 | 24 | 10.3 |
| 14 | 11 | 23 | 20 | 6 | 2 | 7 | 2 | 3 | 10 | -1 | -2 | 6 | 5 | 20 | 19 | 17 | 14 | 40 | 37 | 7 | 17 | 7 | 9 | 3 | 24 | 11.8 |
| 15 | 21 | 8 | 0 | 2 | -2 | 10 | 20 | 67 | 15 | 2 | 29 | 36 | 54 | 48 | 31 | 7 | 6 | 1 | 5 | 7 | -2 | 5 | 7 | 10 | 24 | 16.1 |
| 16 | 3 | -2 | -1 | 6 | 8 | 6 | 12 | 13 | 8 | 19 | 10 | 8 | 1 | -5 | 13 | 13 | 11 | 5 | 2 | 4 | 8 | 18 | 3 | 3 | 24 | 6.9 |
| 17 | 3 | 5 | 0 | 2 | 0 | 10 | -5 | 0 | 6 | 6 | 10 | 8 | 3 | 11 | 10 | 15 | 5 | 19 | 12 | 22 | 14 | 52 | 18 | 4 | 24 | 9.6 |
| 18 | 9 | 9 | 5 | 3 | 3 | 7 | 7 | 3 | 11 | 12 | 15 | 22 | 10 | 7 | 14 | 9 | 7 | 6 | 13 | 10 | 13 | 25 | 28 | -3 | 24 | 10.2 |
| 19 | -1 | 15 | 11 | 7 | 3 | 2 | -1 | 16 | 17 | 14 | 17 | 28 | 22 | 25 | 9 | 9 | 9 | 12 | 15 | 6 | 10 | 9 | 10 | -1 | 24 | 11.0 |
| 20 | 7 | 0 | 2 | -4 | 3 | -5 | 4 | 13 | 28 | 19 | 26 | 3 | 15 | 10 | 14 | 20 | 10 | 4 | 12 | 4 | 12 | 16 | 2 | -1 | 24 | 8.9 |
| 21 | 2 | 2 | 8 | 10 | 6 | 5 | 15 | 30 | 28 | 29 | 43 | 27 | 17 | 20 | 10 | 5 | 26 | 13 | 13 | 28 | 20 | 10 | 16 | 15 | 24 | 16.6 |
| 22 | 18 | 16 | 9 | 9 | 10 | 9 | 15 | 15 | 27 | 41 | 39 | 235 | 105 | 105 | 117 | 75 | 17 | 15 | 12 | 32 | 17 | 41 | 3 | 9 | 24 | 41.3 |
| 23 | 4 | 18 | 21 | 19 | 9 | 22 | 75 | 42 | 34 | 248 | 241 | 90 | 98 | 86 | 29 | 42 | 17 | 4 | 3 | 11 | 1 | 7 | 0 | 8 | 24 | 47.0 |
| 24 | -2 | 7 | -5 | 1 | -2 | 16 | -5 | 14 | 6 | 3 | 2 | 4 | 1 | 1 | -2 | 9 | 14 | 5 | 6 | 13 | 13 | 8 | 23 | 8 | 24 | 5.8 |
| 25 | 12 | 9 | 11 | 23 | 14 | 9 | 21 | 1 | 5 | 11 | 6 | 3 | 13 | 6 | 6 | 17 | 3 | 14 | 13 | 6 | 9 | 11 | 16 | 8 | 24 | 10.3 |
| 26 | 4 | 4 | 11 | 3 | 9 | 19 | 10 | 3 | 2 | 5 | 11 | -5 | 24 | 0 | 9 | 4 | 5 | 2 | 7 | 10 | -5 | 14 | 33 | 19 | 24 | 8.3 |
| 27 | 2 | 16 | 1 | 22 | 13 | 4 | 10 | 17 | 15 | 14 | 25 | 22 | 6 | 8 | 30 | 6 | 8 | -3 | -5 | 37 | 23 | 1 | 50 | -5 | 24 | 13.2 |
| 28 | 3 | -1 | 2 | 2 | -5 | -5 | -4 | 7 | 13 | 18 | 26 | 32 | 36 | 58 | 46 | 22 | 4 | 8 | -1 | -5 | -1 | 5 | 14 | -3 | 24 | 11.3 |
| 29 | 0 | 12 | 3 | 17 | -5 | 1 | 3 | 14 | 9 | 2 | 0 | -1 | -2 | 0 | -2 | -4 | 2 | -3 | -2 | 7 | 6 | 0 | 16 | 0 | 24 | 3.0 |
| 30 | 0 | 14 | 3 | 17 | -5 | -1 | 23 | 8 | 2 | 9 | 3 | -4 | 3 | 7 | 0 | 1 | 2 | 15 | 3 | -5 | 15 | 1 | 11 | 7 | 24 | 5.4 |
| NO. | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 28 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | |
| MAX. | 25 | 23 | 21 | 24 | 16 | 22 | 75 | 67 | 34 | 248 | 241 | 235 | 105 | 105 | 117 | 75 | 26 | 40 | 37 | 37 | 28 | 52 | 50 | 19 | | |
| AVG. | 6 | 7 | 7 | 8 | 5 | 7 | 8 | 11 | 9 | 21 | 20 | 19 | 17 | 17 | 17 | 13 | 8 | 8 | 8 | 10 | 10 | 11 | 11 | 6 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Opportunity Site May 2009** (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | 17 | 5 | 0 | 4 | 1 | 16 | 13 | 10 | 1 | 4 | 6 | 9 | BA | 10 | 7 | 9 | 6 | 4 | 5 | 10 | 10 | -1 | 1 | 14 | 23 | 7.0 |
| 2 | 16 | 4 | 21 | 1 | -2 | 11 | 16 | -1 | 1 | -1 | 6 | 5 | 7 | 6 | -1 | 23 | 17 | 13 | 10 | 14 | 14 | 29 | 8 | -3 | 24 | 8.9 |
| 3 | -4 | 3 | 2 | -3 | 4 | -5 | 19 | 17 | 2 | 9 | 5 | 9 | 6 | 18 | 8 | -3 | -1 | 7 | -5 | -5 | -5 | -5 | -5 | 12 | 24 | 3.3 |
| 4 | -5 | 12 | -3 | 10 | 3 | 3 | 1 | -3 | 10 | 9 | -4 | 16 | 1 | 7 | 3 | 8 | AM | 11 | 5 | 15 | 7 | 11 | 8 | 17 | 23 | 6.2 |
| 5 | 18 | 14 | -3 | 8 | -4 | 9 | 4 | 1 | 15 | 13 | 31 | 62 | 57 | 66 | 6 | -1 | -5 | 5 | 9 | 0 | 0 | 7 | 0 | 1 | 24 | 13.0 |
| 6 | 4 | -5 | 13 | 3 | 0 | 7 | 3 | 4 | -1 | 17 | 5 | 4 | 13 | 3 | -5 | 20 | 3 | 3 | 3 | 1 | -3 | 3 | 9 | -5 | 24 | 4.1 |
| 7 | 4 | -5 | 15 | 12 | -5 | 13 | 8 | 14 | 9 | 22 | -3 | 24 | 12 | 37 | 20 | 3 | 15 | 7 | 13 | 2 | 2 | 7 | -2 | 3 | 24 | 9.5 |
| 8 | 0 | 1 | 7 | 12 | -5 | 10 | -2 | 11 | 2 | 5 | 16 | 7 | 0 | 2 | 0 | 0 | -5 | 6 | 3 | 6 | 0 | 13 | 0 | 20 | 24 | 4.5 |
| 9 | -5 | 22 | -2 | -5 | 28 | -5 | -4 | -1 | -1 | 3 | 0 | 3 | -4 | 4 | 1 | 7 | 1 | -1 | 2 | 28 | 48 | 22 | 8 | 13 | 24 | 6.8 |
| 10 | -1 | 16 | 7 | 20 | -5 | 21 | 7 | 5 | 11 | 4 | 4 | 6 | 5 | 3 | 15 | -2 | 6 | 3 | 12 | 10 | 17 | 18 | 16 | -5 | 24 | 8.0 |
| 11 | 16 | -1 | 12 | 11 | 3 | 10 | 46 | 52 | 21 | 33 | 14 | 17 | 29 | 18 | 27 | 17 | 557 | 20 | 19 | 4 | 7 | 6 | 14 | 15 | 24 | 40.3 |
| 12 | 8 | -5 | 21 | 3 | 0 | 33 | 0 | 15 | 0 | -3 | 28 | 3 | 30 | 18 | 34 | 5 | 30 | 0 | 2 | -2 | 2 | 1 | 5 | 1 | 24 | 9.5 |
| 13 | 0 | 6 | -5 | 17 | 3 | 2 | 3 | -5 | 1 | 5 | -5 | 8 | 0 | 7 | 3 | 2 | 7 | 4 | 6 | 24 | 16 | 8 | 6 | 3 | 24 | 4.8 |
| 14 | 6 | 2 | 2 | 12 | 8 | 14 | 1 | 9 | 19 | 40 | 7 | 9 | 18 | 45 | 3 | 3 | 24 | 0 | -5 | 12 | 9 | -5 | 23 | 6 | 24 | 10.9 |
| 15 | -5 | 5 | -2 | 0 | 27 | -4 | 3 | -3 | 1 | 4 | -1 | 0 | 6 | 7 | 4 | 1 | 9 | 11 | 6 | 9 | 27 | 13 | 13 | 15 | 24 | 6.1 |
| 16 | -1 | -1 | 16 | 2 | 8 | 11 | 5 | 33 | 17 | 16 | 15 | 12 | 16 | 23 | 14 | 19 | 20 | 11 | 18 | 16 | 11 | 30 | 19 | 24 | 24 | 14.8 |
| 17 | 19 | 17 | 14 | 13 | 25 | 4 | 10 | 9 | 25 | 23 | 43 | 19 | 10 | 9 | 6 | 6 | 15 | 8 | 12 | 14 | 39 | 16 | 17 | 7 | 24 | 15.8 |
| 18 | 12 | 15 | 11 | 12 | 18 | 9 | 25 | 46 | 36 | 27 | 53 | 48 | 43 | 41 | 18 | 32 | 21 | 21 | 13 | 24 | 15 | 26 | 17 | 12 | 24 | 24.8 |
| 19 | 22 | 10 | 7 | 21 | 20 | 30 | 42 | 35 | 63 | 196 | 167 | 129 | 100 | 110 | 113 | 310 | 299 | 536 | 176 | 37 | 34 | 2 | 6 | 13 | 24 | 103.3 |
| 20 | 4 | 13 | 7 | 8 | 13 | 16 | 38 | 12 | 12 | 17 | 29 | 16 | 44 | 28 | 50 | 21 | 15 | 8 | 7 | 42 | 25 | 2 | 3 | 14 | 24 | 18.5 |
| 21 | 5 | 4 | 4 | 4 | -5 | 14 | 13 | 14 | 7 | 18 | 4 | 15 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 12 | 8.1 |
| 22 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 0 | #DIV/0! |
| 23 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 0 | #DIV/0! |
| 24 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 5 | 4 | 1 | 2 | 8 | 2 | 2 | 14 | -5 | 12 | 10 | 4.5 |
| 25 | 6 | 9 | 0 | 13 | -5 | 8 | 18 | 14 | -1 | 4 | 5 | 12 | 13 | 7 | 7 | 3 | 12 | 18 | 9 | 3 | 16 | -2 | 2 | -3 | 24 | 7.0 |
| 26 | 7 | 5 | -1 | 1 | 6 | 23 | 10 | 7 | 10 | 4 | 18 | 16 | 18 | 13 | 8 | 17 | 12 | 11 | 14 | 14 | 34 | 7 | 12 | 19 | 24 | 11.9 |
| 27 | -4 | 12 | 2 | 16 | -2 | 37 | 10 | 8 | 16 | 23 | 14 | 21 | 48 | 52 | 65 | 51 | BA | 16 | 10 | 14 | 9 | 4 | 18 | 3 | 23 | 19.3 |
| 28 | -3 | 10 | 13 | 9 | 4 | 20 | 60 | 20 | 41 | 27 | 2 | 11 | 24 | 32 | 41 | 51 | 52 | 18 | 18 | 10 | 33 | 32 | 9 | 5 | 24 | 22.5 |
| 29 | 11 | 5 | 19 | 6 | -1 | 19 | 15 | 9 | 30 | 21 | 29 | 89 | 84 | 95 | 80 | 175 | 3 | 20 | 11 | 17 | -5 | 28 | 6 | 10 | 24 | 32.3 |
| 30 | 10 | 9 | -3 | 13 | 0 | 15 | 4 | 4 | 15 | 20 | 8 | 8 | 68 | 133 | 30 | 33 | 43 | 62 | 22 | 24 | 30 | 30 | 14 | 18 | 24 | 25.4 |
| 31 | 18 | 12 | 5 | 13 | 16 | 1 | 13 | 3 | 3 | 15 | 14 | 16 | 10 | 28 | 19 | 18 | 14 | 17 | 21 | 13 | 7 | 51 | 6 | 16 | 24 | 14.5 |
| NO. | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 26 | 27 | 28 | 28 | 26 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | | |
| MAX. | 22 | 22 | 21 | 21 | 28 | 37 | 60 | 52 | 63 | 196 | 167 | 129 | 100 | 133 | 113 | 310 | 557 | 536 | 176 | 42 | 48 | 51 | 23 | 24 | | |
| AVG. | 6 | 7 | 6 | 8 | 5 | 12 | 14 | 12 | 13 | 21 | 18 | 21 | 25 | 30 | 21 | 30 | 45 | 30 | 15 | 13 | 14 | 13 | 8 | 9 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Opportunity Site June 2009** (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | 22 | 9 | 5 | 17 | 50 | 59 | 60 | 124 | 110 | BA | BA | BA | 27 | 24 | 17 | 29 | 17 | 22 | 13 | 14 | 24 | 10 | 15 | 7 | 21 | 32.1 |
| 2 | 13 | 5 | 15 | 5 | 13 | 15 | 10 | 15 | 6 | 8 | 13 | 13 | 20 | 13 | 21 | 14 | 44 | 15 | 12 | 7 | 26 | 6 | 11 | 5 | 24 | 13.5 |
| 3 | 11 | 6 | -2 | 13 | -3 | -5 | 18 | 7 | 15 | 7 | 10 | 8 | 13 | 22 | 13 | 10 | 15 | 36 | 232 | 39 | 30 | 20 | 6 | 13 | 24 | 22.3 |
| 4 | 9 | -5 | -5 | 9 | 3 | 8 | 27 | 15 | 25 | 12 | 8 | 34 | 12 | 35 | 26 | 12 | 5 | 21 | 5 | 53 | 7 | 0 | 5 | -3 | 24 | 13.3 |
| 5 | 6 | 8 | 7 | 3 | 8 | 3 | -3 | 1 | 9 | 10 | 21 | BA | 82 | 45 | 98 | 7 | 14 | 3 | 14 | -3 | 0 | 13 | 4 | -2 | 23 | 15.1 |
| 6 | 4 | 4 | -3 | 4 | 26 | 17 | 0 | 10 | -5 | 5 | 5 | -5 | 20 | -5 | 1 | 4 | -3 | 0 | -5 | 12 | -5 | 12 | 0 | 2 | 24 | 4.0 |
| 7 | -1 | 1 | -4 | 4 | 8 | 2 | 1 | 4 | -3 | 27 | -5 | 22 | -5 | -1 | 25 | -5 | 14 | -3 | -3 | 10 | 1 | 12 | 9 | 2 | 24 | 4.7 |
| 8 | 0 | 5 | 18 | -5 | 11 | 3 | 11 | 16 | -4 | 29 | 8 | 18 | 15 | 18 | 10 | 1 | 4 | 0 | 4 | 2 | 0 | 0 | -2 | -3 | 24 | 6.6 |
| 9 | 10 | 1 | -3 | -5 | -2 | 30 | -5 | -3 | 1 | -4 | 5 | 3 | 11 | 9 | 13 | 16 | 8 | 4 | 7 | 18 | 11 | 9 | 3 | 1 | 24 | 5.8 |
| 10 | 12 | 9 | -5 | 0 | 9 | -2 | 21 | 8 | 19 | 15 | 12 | 10 | 15 | 25 | 24 | 89 | 45 | 7 | 8 | 25 | 8 | 11 | 14 | 9 | 24 | 16.2 |
| 11 | -5 | 27 | -5 | 11 | 5 | 27 | 2 | 9 | 16 | 18 | 12 | 3 | 15 | 15 | 70 | 63 | 35 | 80 | 28 | 7 | 25 | 24 | -4 | 21 | 24 | 20.8 |
| 12 | 17 | -5 | 9 | 3 | 7 | 25 | 9 | 15 | 7 | 10 | 12 | 15 | BA | 15 | 26 | 31 | 39 | 23 | 95 | 50 | 39 | 13 | 19 | 11 | 23 | 21.1 |
| 13 | 8 | 4 | 5 | 2 | 6 | 17 | 4 | 28 | 7 | -3 | 11 | -5 | 12 | 35 | 29 | 24 | 415 | 28 | 28 | 33 | 15 | 16 | -3 | 7 | 24 | 30.1 |
| 14 | 2 | -2 | 10 | -2 | 6 | 14 | 12 | -5 | 6 | 6 | 17 | 4 | 69 | 6 | 10 | 3 | 12 | 48 | 11 | 2 | 0 | 13 | -3 | 5 | 24 | 10.2 |
| 15 | 1 | 13 | -5 | 3 | -2 | 17 | 1 | 12 | 6 | -3 | 8 | 16 | 6 | 15 | 1 | 19 | 0 | 0 | 17 | 1 | -4 | 11 | -1 | 3 | 24 | 5.6 |
| 16 | 3 | 8 | -5 | 11 | 3 | -1 | 11 | 14 | 2 | 2 | 12 | 22 | 8 | 31 | 50 | 60 | 32 | 42 | 75 | 31 | 12 | 31 | 4 | 39 | 24 | 20.7 |
| 17 | 14 | 7 | -5 | 6 | 12 | -5 | 24 | -4 | 7 | 4 | 11 | 48 | 21 | 3 | 36 | -5 | 24 | 7 | 13 | 6 | -3 | 24 | 6 | 2 | 24 | 10.5 |
| 18 | 0 | 5 | 0 | 0 | 1 | 21 | 4 | 12 | 1 | 1 | 15 | -2 | 47 | 67 | 112 | 38 | 24 | 77 | 9 | 30 | 24 | 3 | 13 | 8 | 24 | 21.3 |
| 19 | 8 | 12 | 7 | 6 | 12 | 27 | 10 | 14 | 15 | 23 | 23 | 30 | 29 | 13 | 20 | 34 | 25 | 4 | -2 | 13 | 7 | 4 | -1 | 2 | 24 | 14.0 |
| 20 | 7 | 2 | -2 | 21 | 2 | -5 | 1 | 9 | 2 | 5 | 3 | 13 | 8 | 5 | -5 | 13 | -5 | 3 | 0 | 7 | -4 | 13 | -2 | 0 | 24 | 3.8 |
| 21 | 6 | 5 | -4 | 4 | 8 | 6 | -3 | 2 | 8 | 0 | 1 | 8 | 13 | 20 | 26 | 12 | 13 | 4 | -2 | 15 | 0 | -1 | 5 | -3 | 24 | 6.0 |
| 22 | 2 | -1 | -1 | 2 | 3 | 14 | -2 | 3 | 3 | 0 | -3 | 0 | BA | 4 | 5 | -2 | 5 | 13 | 1 | 7 | -2 | 1 | -2 | -2 | 23 | 2.1 |
| 23 | 16 | -5 | 3 | -5 | 5 | 11 | 7 | 2 | 17 | 7 | 8 | 5 | 14 | 9 | 6 | 20 | 15 | 12 | 15 | 14 | 25 | 18 | 14 | 6 | 24 | 10.0 |
| 24 | -5 | 22 | 9 | 9 | 16 | 20 | 18 | 36 | 31 | 32 | 35 | 23 | 38 | 37 | 23 | 21 | 24 | 25 | 23 | 25 | 24 | 26 | 15 | 16 | 24 | 22.6 |
| 25 | 22 | 22 | 13 | 15 | 13 | 15 | 77 | 10 | 18 | 72 | 101 | 108 | 97 | 108 | 95 | 69 | 100 | 37 | 32 | 39 | 30 | 39 | 26 | 24 | 24 | 49.3 |
| 26 | 40 | 12 | 35 | 2 | 0 | 29 | 12 | 15 | 34 | 12 | 8 | 14 | 18 | 12 | 13 | 61 | 46 | 43 | 35 | 45 | 30 | 38 | 31 | 22 | 24 | 25.3 |
| 27 | 16 | 17 | 13 | 13 | 28 | 8 | 15 | 15 | 32 | 15 | 12 | 19 | 17 | 28 | 22 | 24 | 33 | 28 | 25 | 21 | 27 | 51 | 18 | 14 | 24 | 21.3 |
| 28 | 32 | 11 | 21 | 21 | 22 | 13 | 27 | 29 | 28 | 31 | 27 | 37 | 58 | 52 | 46 | 34 | 31 | 56 | 37 | 41 | 39 | 54 | 38 | 28 | 24 | 33.9 |
| 29 | 21 | 19 | 21 | 9 | 20 | 64 | 19 | 29 | 33 | 30 | 24 | 23 | 37 | 29 | 47 | 47 | 79 | 70 | 37 | 29 | 28 | 42 | 43 | 32 | 24 | 34.7 |
| 30 | 20 | 21 | 9 | 4 | 17 | 40 | 33 | 27 | 19 | 41 | 26 | 25 | 26 | 40 | 49 | 39 | 48 | 59 | 33 | 34 | 19 | 36 | 35 | 33 | 24 | 30.5 |
| NO. | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 29 | 28 | 28 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | |
| MAX. | 40 | 27 | 35 | 21 | 50 | 64 | 77 | 124 | 110 | 72 | 101 | 108 | 97 | 108 | 112 | 89 | 415 | 80 | 232 | 53 | 39 | 54 | 43 | 39 | | |
| AVG. | 10 | 8 | 5 | 6 | 10 | 16 | 14 | 16 | 16 | 14 | 15 | 18 | 27 | 24 | 31 | 26 | 39 | 25 | 27 | 21 | 14 | 18 | 11 | 10 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Warm Springs Site April 2009** (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | 2 | -2 | -3 | 3 | -5 | -5 | -2 | -5 | -5 | -5 | 2 | -4 | 0 | 2 | BA | -5 | -5 | AV | AV | 6 | -5 | -1 | -5 | 2 | 21 | -1.9 |
| 2 | 3 | -2 | -3 | -3 | -3 | -1 | -5 | 4 | -5 | 4 | -3 | 5 | 2 | 6 | -4 | -4 | 5 | -4 | 7 | 7 | 2 | 0 | 11 | 10 | 24 | 1.2 |
| 3 | -5 | -5 | 6 | 5 | -5 | 3 | -4 | 6 | -5 | 6 | 2 | 5 | 4 | 6 | 4 | -5 | 5 | -2 | -4 | 10 | -5 | 15 | 0 | 4 | 24 | 1.7 |
| 4 | 2 | 4 | 2 | 0 | 9 | 6 | -5 | -5 | -5 | 4 | -5 | -5 | 0 | -3 | 0 | -1 | 0 | -2 | -4 | 3 | -5 | 5 | 12 | 5 | 24 | 0.5 |
| 5 | 9 | -5 | 2 | -5 | 26 | 2 | 5 | -5 | -5 | -4 | 1 | 4 | -2 | BA | 14 | -2 | -2 | -3 | 8 | -5 | 7 | -5 | 14 | -1 | 23 | 2.1 |
| 6 | -5 | -5 | 9 | 12 | -5 | -5 | 7 | 3 | -5 | 3 | 11 | 8 | 9 | 9 | 1 | 10 | 3 | 7 | 9 | -5 | 0 | 16 | 5 | -3 | 24 | 3.7 |
| 7 | 6 | 6 | -5 | -5 | 13 | -3 | -5 | -5 | 5 | 8 | 5 | 10 | 1 | -2 | 8 | 9 | -1 | 6 | -5 | 1 | 2 | 2 | 10 | 3 | 24 | 2.7 |
| 8 | 1 | 8 | 3 | -1 | 11 | 6 | 2 | 3 | 5 | 9 | 16 | 4 | 6 | 3 | 13 | 4 | 2 | 5 | 3 | 5 | -4 | 0 | 0 | 11 | 24 | 4.8 |
| 9 | -3 | 6 | 4 | 8 | 8 | 5 | 9 | -3 | 5 | -5 | 14 | -1 | 8 | 3 | 2 | 5 | 6 | 3 | 2 | -4 | 17 | -5 | 7 | 2 | 24 | 3.9 |
| 10 | 13 | -5 | 21 | 8 | 12 | 19 | -5 | -4 | 5 | 8 | 9 | 5 | 1 | 1 | -5 | -5 | 7 | 0 | 7 | AV | AV | AV | -5 | 15 | 21 | 4.9 |
| 11 | 5 | 24 | 5 | 14 | -5 | 11 | 15 | -5 | 2 | -3 | 9 | 7 | -5 | 2 | 2 | 15 | -5 | 4 | -1 | 6 | 13 | -5 | 8 | -5 | 24 | 4.5 |
| 12 | 1 | -1 | 7 | -5 | 1 | -5 | -3 | -1 | 0 | 4 | 2 | -4 | 6 | -2 | 4 | 10 | 7 | -5 | -1 | -5 | 2 | 7 | -5 | -2 | 24 | 0.5 |
| 13 | -3 | -3 | 6 | 5 | 8 | -3 | -5 | -5 | -2 | 10 | 3 | -5 | -5 | 6 | -1 | 5 | -1 | 2 | 1 | 3 | -2 | -5 | -2 | -1 | 24 | 0.3 |
| 14 | -5 | 14 | 13 | -5 | 5 | 2 | -5 | 3 | -5 | -2 | -3 | 1 | 4 | 1 | 1 | 3 | 6 | 9 | 3 | 13 | 12 | -5 | 8 | 6 | 24 | 3.1 |
| 15 | -5 | 1 | 1 | 0 | -2 | 7 | 1 | 11 | 6 | -3 | 14 | 5 | -5 | 1 | 1 | 1 | 3 | -5 | -1 | 4 | 5 | 10 | 5 | -5 | 24 | 2.1 |
| 16 | -2 | 7 | -3 | -5 | -1 | 6 | 0 | -5 | 5 | 7 | -4 | 2 | 6 | 11 | 5 | 1 | 3 | -1 | -2 | -5 | 6 | 4 | 7 | 6 | 24 | 2.0 |
| 17 | 3 | 6 | 7 | -5 | -5 | 28 | -5 | -5 | 14 | 4 | 6 | 13 | 7 | 6 | 5 | 4 | 11 | -4 | -2 | 3 | 2 | 3 | 12 | 9 | 24 | 4.9 |
| 18 | 3 | 3 | -5 | 9 | -5 | 3 | -5 | 8 | 2 | 11 | 14 | 11 | 9 | 7 | 5 | 9 | 6 | 3 | 3 | -5 | 7 | -5 | 0 | 3 | 24 | 3.8 |
| 19 | 1 | -5 | 4 | 4 | -5 | 10 | -5 | -3 | 7 | 13 | 7 | 12 | 12 | 1 | -5 | 4 | 2 | 7 | -5 | -5 | 0 | 5 | 1 | 2 | 24 | 2.5 |
| 20 | -5 | 3 | 4 | 1 | -2 | 11 | -5 | 14 | -5 | 11 | 15 | 6 | -5 | 2 | 0 | 11 | 5 | 2 | -5 | -3 | -5 | 4 | -5 | 7 | 24 | 2.3 |
| 21 | -2 | 2 | 2 | -2 | 2 | -2 | -1 | 12 | 6 | 13 | 7 | 15 | 3 | 5 | 0 | 2 | -4 | 1 | -5 | -5 | -4 | -4 | 0 | 12 | 24 | 2.2 |
| 22 | 8 | 8 | 1 | 13 | -5 | 16 | 5 | 15 | 10 | 7 | 24 | 1 | 8 | 13 | 5 | -5 | 1 | 10 | -5 | -5 | 9 | 5 | 4 | 2 | 24 | 6.0 |
| 23 | 9 | 0 | 17 | 0 | 11 | 0 | 4 | 7 | 30 | 32 | 52 | 13 | 13 | 5 | 2 | -5 | 1 | -5 | 4 | 3 | 1 | -2 | 4 | 3 | 24 | 8.3 |
| 24 | -5 | 1 | 1 | -4 | 4 | -5 | -4 | -5 | 7 | -4 | 9 | 9 | -3 | 7 | -5 | 9 | 13 | -1 | 13 | -1 | 2 | -1 | 15 | -5 | 24 | 2.0 |
| 25 | 5 | 4 | 4 | 1 | 16 | 1 | -3 | 6 | 6 | 3 | 10 | 5 | 4 | 11 | 0 | 16 | 2 | 1 | 2 | -3 | 1 | 10 | 1 | 0 | 24 | 4.3 |
| 26 | 9 | -4 | 5 | -5 | 4 | 18 | 8 | 6 | -5 | 11 | 6 | 6 | 7 | 5 | 5 | -2 | -2 | -5 | 3 | 6 | -4 | 4 | 2 | 1 | 24 | 3.3 |
| 27 | -2 | 11 | -1 | 10 | 1 | 4 | 3 | 8 | 7 | 1 | 14 | 7 | 6 | 2 | 2 | 0 | 13 | -5 | -4 | 1 | 27 | 10 | 17 | 1 | 24 | 5.5 |
| 28 | 4 | -4 | -5 | 4 | -5 | 0 | 8 | -2 | -1 | 22 | 6 | -5 | -5 | 12 | 32 | 5 | -3 | -4 | -5 | -5 | -5 | -1 | 28 | -5 | 24 | 2.8 |
| 29 | 5 | 16 | 11 | 15 | 30 | 2 | 4 | 8 | 5 | -5 | 1 | -1 | 3 | -3 | -5 | 2 | -1 | -5 | -1 | -5 | 4 | 0 | 9 | -2 | 24 | 3.6 |
| 30 | 5 | 14 | 9 | 9 | -5 | 11 | 20 | -2 | 8 | 7 | 9 | 2 | 7 | 4 | 5 | 0 | -5 | 2 | -4 | -1 | 5 | -5 | -5 | -5 | 24 | 3.5 |
| NO. | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 29 | 30 | 30 | 29 | 29 | 29 | 29 | 29 | 30 | 30 | | |
| MAX. | 13 | 24 | 21 | 15 | 30 | 28 | 20 | 15 | 30 | 32 | 52 | 15 | 13 | 13 | 32 | 16 | 13 | 10 | 13 | 13 | 27 | 16 | 28 | 15 | | |
| AVG. | 2 | 3 | 4 | 3 | 3 | 5 | 1 | 2 | 3 | 6 | 8 | 4 | 3 | 4 | 3 | 3 | 2 | 0 | 0 | 0 | 3 | 2 | 5 | 2 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Warm Springs Site May 2009** (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | -4 | 15 | 2 | -2 | -3 | 3 | -5 | 12 | 9 | 7 | 4 | BA | 12 | 0 | 5 | 2 | 2 | -5 | -2 | 4 | -5 | -5 | 5 | 5 | 23 | 2.4 |
| 2 | -1 | 4 | 1 | 10 | 10 | -5 | 2 | 9 | 16 | 16 | 1 | 19 | 2 | 9 | 9 | 5 | -3 | -2 | -3 | 3 | -2 | 2 | 5 | 4 | 24 | 4.6 |
| 3 | 15 | 5 | 8 | 2 | 3 | 3 | 11 | -1 | 3 | 12 | 5 | 0 | 7 | -3 | -3 | -4 | -5 | 6 | -1 | 6 | -2 | -1 | 0 | 1 | 24 | 2.8 |
| 4 | -5 | -2 | 10 | -5 | -1 | -5 | 7 | 4 | 4 | 20 | 5 | 22 | 3 | 9 | -3 | 9 | -5 | -4 | 2 | -5 | -1 | -5 | 4 | 6 | 24 | 2.7 |
| 5 | 4 | 8 | -2 | 2 | -5 | 9 | -5 | -1 | 12 | 6 | -1 | 21 | 13 | 11 | -5 | -1 | -5 | 7 | 9 | -5 | -5 | 0 | -5 | 14 | 24 | 3.2 |
| 6 | -5 | -3 | -2 | 4 | -3 | -2 | 0 | 6 | 11 | 13 | 1 | -3 | 8 | -4 | -5 | 3 | 2 | 2 | -5 | -5 | -1 | -5 | 11 | -5 | 24 | 0.5 |
| 7 | 5 | 4 | 3 | 7 | 4 | 10 | 12 | 9 | 24 | 8 | 2 | -5 | 19 | 5 | -5 | 4 | -5 | 8 | -5 | -5 | -5 | 3 | -1 | 3 | 24 | 4.1 |
| 8 | -4 | 3 | 11 | -5 | 14 | -3 | 16 | 4 | 8 | 9 | -3 | 7 | -5 | 5 | 2 | 0 | 2 | 10 | -5 | -5 | -5 | -4 | 14 | -5 | 24 | 2.5 |
| 9 | 9 | -5 | 2 | -5 | 20 | -5 | 12 | -2 | 18 | 20 | 6 | 9 | -3 | 10 | 6 | 2 | -5 | -5 | -5 | 3 | -1 | -3 | -2 | 12 | 24 | 3.7 |
| 10 | -4 | 7 | -5 | 11 | 12 | -5 | 11 | 8 | 29 | 14 | 12 | 0 | 3 | 4 | 9 | 3 | 8 | -5 | -5 | 9 | -3 | -5 | 6 | -5 | 24 | 4.5 |
| 11 | 10 | 16 | -5 | 7 | 4 | 5 | 11 | 22 | 28 | 11 | 13 | 6 | 19 | 4 | 12 | 10 | 22 | -5 | 16 | -5 | 0 | 0 | 6 | 0 | 24 | 8.6 |
| 12 | 13 | -3 | 23 | -2 | 21 | -4 | 21 | 4 | 11 | 4 | -5 | 17 | 0 | -2 | 2 | 9 | 5 | -2 | -2 | -5 | -5 | 6 | -5 | 2 | 24 | 4.3 |
| 13 | -1 | 12 | -5 | 5 | 4 | 0 | -3 | 10 | 11 | 9 | -3 | 9 | 4 | -3 | 10 | -5 | 3 | 2 | -5 | -5 | 0 | -4 | 2 | -1 | 24 | 1.9 |
| 14 | 5 | 4 | 3 | 8 | 2 | 7 | 3 | 11 | 3 | 14 | 10 | 3 | -3 | 19 | -5 | 4 | 21 | -5 | -5 | 0 | -2 | 0 | 5 | 8 | 24 | 4.6 |
| 15 | -5 | 7 | -5 | 12 | -5 | 8 | 1 | 9 | 4 | 8 | 4 | 12 | 1 | 5 | 10 | 8 | -5 | 2 | -5 | -3 | -5 | -5 | -5 | 6 | 24 | 2.3 |
| 16 | 12 | 14 | -3 | 6 | 4 | 14 | 6 | 16 | 25 | 8 | 5 | 14 | 10 | 5 | 31 | -5 | 16 | 2 | 1 | 12 | -4 | -3 | 9 | 14 | 24 | 8.7 |
| 17 | 13 | 7 | 3 | 17 | 12 | 10 | 4 | 24 | 30 | 19 | 13 | 9 | 11 | -3 | 4 | 6 | 5 | 0 | 13 | 0 | -5 | -5 | 7 | 3 | 24 | 8.2 |
| 18 | 11 | 8 | 6 | 18 | 11 | 4 | 19 | 31 | 26 | 19 | 9 | 15 | 16 | 10 | 79 | 21 | 4 | 9 | 4 | 11 | -5 | -5 | 8 | 14 | 24 | 14.3 |
| 19 | -1 | 11 | 6 | 9 | 11 | 7 | 18 | 33 | 34 | 39 | 38 | 36 | 37 | 40 | 33 | 67 | 8 | 29 | 5 | 1 | -2 | 2 | 10 | 1 | 24 | 19.7 |
| 20 | 2 | -1 | 0 | 9 | 7 | 5 | 5 | 6 | 16 | 5 | 10 | 18 | 0 | 4 | 11 | 0 | 8 | 2 | -1 | 9 | -5 | -3 | 2 | 6 | 24 | 4.8 |
| 21 | 2 | -2 | 2 | 9 | -4 | 6 | 6 | 36 | 17 | 10 | 11 | 15 | 3 | 10 | 6 | 12 | 6 | 4 | 5 | 13 | 6 | 11 | 11 | 11 | 24 | 8.6 |
| 22 | 14 | 7 | -5 | 25 | 11 | 3 | 18 | 21 | 15 | 11 | 12 | 8 | 9 | 7 | 4 | 7 | 9 | 4 | 9 | -1 | 0 | 3 | 7 | 5 | 24 | 8.5 |
| 23 | 4 | 14 | 7 | 10 | 0 | 13 | 5 | 26 | 25 | 16 | 16 | 7 | 11 | 3 | 14 | 5 | 8 | 18 | 16 | -1 | 0 | 10 | -5 | 7 | 24 | 9.5 |
| 24 | 5 | 7 | -1 | 4 | 8 | 8 | 4 | 3 | 5 | 1 | 3 | 7 | 17 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 13 | 5.5 |
| 25 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 0 | #DIV/0! |
| 26 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 0 | #DIV/0! |
| 27 | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | BA | 6 | 6 | 2 | -2 | -5 | -2 | -5 | -5 | 8 | -0.6 |
| 28 | 2 | 24 | -5 | -2 | 13 | 14 | 1 | 27 | 15 | 12 | 10 | 4 | -3 | 9 | 6 | 4 | 2 | -2 | 4 | 1 | -5 | -4 | -5 | 23 | 24 | 6.0 |
| 29 | -3 | -1 | 25 | -5 | 10 | 8 | 0 | 33 | 21 | 13 | 15 | 13 | 7 | 2 | BA | 28 | -5 | 23 | 14 | 8 | -5 | 20 | -5 | -5 | 23 | 9.2 |
| 30 | 0 | 4 | 12 | -5 | 14 | 6 | 4 | 7 | 15 | 3 | 11 | 5 | 5 | 3 | 4 | -2 | 7 | 7 | 0 | 15 | -5 | -3 | -5 | 4 | 24 | 4.4 |
| 31 | 7 | 6 | -5 | 6 | 9 | 2 | 7 | 10 | 24 | 10 | 17 | 9 | 7 | 7 | 3 | 6 | 9 | 8 | 4 | 3 | -5 | -5 | 10 | 7 | 24 | 6.5 |
| NO. | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 27 | 28 | 27 | 26 | 27 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | | |
| MAX. | 15 | 24 | 25 | 25 | 21 | 14 | 21 | 36 | 34 | 39 | 38 | 36 | 37 | 40 | 79 | 67 | 22 | 29 | 16 | 15 | 6 | 20 | 14 | 23 | | |
| AVG. | 4 | 6 | 3 | 5 | 7 | 4 | 7 | 13 | 16 | 12 | 8 | 10 | 8 | 6 | 9 | 7 | 4 | 4 | 2 | 2 | -3 | 0 | 3 | 5 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Warm Springs Site June 2009** (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

| | Hour Beginning | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | OBS | MEAN |
| 1 | 7 | -5 | 6 | -5 | 31 | 9 | 11 | 14 | 10 | 11 | 16 | 7 | BA | 3 | 1 | 14 | 6 | 2 | 11 | 2 | 11 | 9 | 6 | 3 | 23 | 7.8 |
| 2 | 8 | 12 | 5 | 12 | 3 | 9 | 6 | 1 | 7 | 9 | 4 | 4 | 6 | 7 | -1 | 6 | 3 | -5 | 6 | 5 | -1 | 3 | 7 | 3 | 24 | 5.0 |
| 3 | 12 | 6 | 1 | -1 | 6 | -5 | 12 | 4 | 11 | 11 | -1 | 4 | 6 | -4 | 4 | -3 | 3 | -4 | 0 | 6 | -5 | -4 | 7 | -2 | 24 | 2.7 |
| 4 | -3 | -5 | 13 | -3 | -5 | 9 | 15 | 14 | 22 | 9 | 12 | 14 | 3 | 8 | -2 | -5 | 19 | 22 | 3 | 3 | -5 | 12 | 12 | 5 | 24 | 7.0 |
| 5 | 4 | -1 | -1 | 2 | 0 | 1 | 9 | -2 | 10 | -1 | BA | 35 | -4 | 18 | 7 | -5 | 21 | 44 | 5 | 48 | -5 | -5 | 7 | 13 | 23 | 8.7 |
| 6 | -5 | 12 | 11 | -3 | -2 | 16 | 4 | 46 | 1 | 0 | -2 | 3 | 8 | 0 | -1 | 3 | 2 | 3 | 5 | 4 | -5 | 7 | -2 | 10 | 24 | 4.8 |
| 7 | 7 | -4 | 11 | -1 | 8 | -5 | 0 | 2 | 5 | -5 | 3 | 9 | -3 | 3 | -1 | 6 | -5 | -2 | -2 | -5 | -3 | -4 | 10 | 16 | 24 | 1.7 |
| 8 | -5 | 24 | -5 | 8 | -2 | 11 | 17 | -5 | 19 | 11 | -5 | 17 | 5 | 1 | -5 | 10 | 5 | -5 | 0 | -5 | 5 | 3 | -3 | 4 | 24 | 4.2 |
| 9 | 0 | -4 | 19 | -5 | -5 | 20 | -5 | 8 | -1 | 2 | 15 | 9 | 3 | 2 | 38 | 7 | -2 | 0 | 2 | -5 | -5 | -4 | 3 | 10 | 24 | 4.3 |
| 10 | -5 | 13 | -3 | 6 | 0 | 10 | 4 | 11 | 17 | 8 | 8 | 8 | 1 | 8 | 8 | -1 | 5 | -5 | 2 | 2 | -5 | -2 | 3 | -5 | 24 | 3.7 |
| 11 | 9 | 15 | -5 | 10 | 6 | 4 | 13 | 22 | 20 | 9 | 1 | 10 | 3 | 9 | -4 | 10 | -1 | -5 | 10 | 5 | -5 | -3 | -5 | 5 | 24 | 5.5 |
| 12 | 17 | -5 | 16 | -2 | 10 | 16 | 3 | 21 | 29 | 15 | 13 | BA | 12 | 14 | 7 | 8 | -1 | 18 | 6 | -3 | -5 | 4 | 2 | -1 | 23 | 8.4 |
| 13 | 2 | 6 | 6 | 0 | 1 | 15 | 1 | 15 | 17 | 7 | 13 | 9 | -4 | 8 | 2 | 9 | -5 | 26 | 10 | -2 | 11 | 2 | 7 | -5 | 24 | 6.3 |
| 14 | 4 | 7 | 1 | 7 | 3 | 10 | -1 | 7 | 7 | 9 | 1 | 6 | -5 | 9 | 8 | 0 | 12 | 13 | -5 | -2 | -5 | 10 | -3 | -5 | 24 | 3.7 |
| 15 | 8 | 4 | 9 | 2 | -3 | -3 | 7 | -4 | 12 | 4 | 0 | 7 | 13 | -5 | 12 | -5 | 16 | 8 | -5 | 14 | -2 | 5 | AH | AH | 22 | 4.3 |
| 16 | AH | AH | AH | AH | AH | AH | AH | AH | AH | AH | AH | 13 | 13 | 0 | 50 | 25 | 11 | -5 | -5 | 10 | -5 | 50 | -5 | 10 | 13 | 12.5 |
| 17 | 17 | 11 | 7 | 10 | 11 | -5 | 11 | -5 | 13 | 3 | 13 | 8 | -5 | 4 | 8 | -5 | 22 | 24 | -5 | -5 | 5 | 4 | 12 | 12 | 24 | 6.9 |
| 18 | -4 | -5 | 2 | 3 | 4 | 4 | 9 | 12 | 9 | -5 | 10 | 2 | 13 | -5 | 16 | 6 | 3 | -5 | 11 | 2 | -5 | -2 | 4 | 8 | 24 | 3.6 |
| 19 | -5 | 7 | 8 | 14 | -4 | 10 | 13 | 3 | 15 | 11 | 20 | 5 | 7 | 2 | 9 | 19 | 6 | -4 | 6 | 3 | 5 | 7 | 5 | 9 | 24 | 7.1 |
| 20 | -1 | 15 | -5 | 2 | 12 | -1 | 1 | 6 | 2 | 9 | 4 | 3 | 2 | 2 | -2 | 1 | 17 | 4 | -5 | 2 | 4 | -5 | 10 | 4 | 24 | 3.4 |
| 21 | -5 | 10 | 3 | -4 | 5 | -4 | 19 | -5 | 6 | 6 | 4 | 3 | 5 | 2 | 5 | 7 | -5 | 8 | -5 | 6 | 17 | -5 | 3 | -4 | 24 | 3.0 |
| 22 | -1 | 6 | -2 | 1 | -4 | 3 | 7 | -5 | -1 | 2 | 11 | 0 | BA | -5 | 7 | -4 | 0 | 6 | 6 | 1 | -5 | -5 | -5 | 16 | 23 | 1.3 |
| 23 | 6 | -2 | -4 | 8 | 1 | -1 | 8 | 6 | 13 | 5 | 5 | 6 | 13 | 4 | 2 | 1 | -1 | 2 | 4 | -2 | -5 | -5 | 4 | 8 | 24 | 3.2 |
| 24 | -4 | 7 | 10 | 4 | -1 | 2 | 16 | 18 | 28 | 15 | 8 | 13 | -2 | 10 | 5 | -1 | 2 | 78 | 3 | 3 | -2 | -4 | 2 | 7 | 24 | 9.0 |
| 25 | 0 | 8 | 4 | 9 | 10 | 4 | 15 | 16 | 21 | 8 | 2 | 8 | 17 | 6 | 7 | 14 | 11 | 17 | 10 | 15 | 1 | 7 | 7 | -5 | 24 | 8.8 |
| 26 | 21 | -5 | 24 | 5 | 2 | 24 | 4 | 27 | 18 | 12 | 10 | 15 | 3 | 7 | 8 | 11 | 3 | 6 | 0 | 1 | -5 | -5 | 8 | 0 | 24 | 8.1 |
| 27 | 8 | 4 | 13 | 6 | 5 | 9 | 2 | 19 | 22 | 19 | 6 | 12 | 9 | 9 | 8 | 32 | 13 | 6 | 8 | 0 | -4 | -1 | -5 | 23 | 24 | 9.3 |
| 28 | 5 | 4 | 9 | 9 | 11 | 4 | 8 | 32 | 8 | 17 | 12 | 6 | 10 | 7 | 190 | -5 | 0 | 11 | 4 | 8 | -1 | 11 | -3 | 6 | 24 | 15.1 |
| 29 | 9 | 10 | 8 | 14 | 10 | 12 | 6 | 32 | 25 | 14 | 16 | 10 | 20 | 6 | 9 | 7 | -1 | 17 | 13 | 7 | 0 | -3 | 3 | 6 | 24 | 10.4 |
| 30 | -5 | 24 | 7 | 10 | 13 | -5 | 32 | 13 | 32 | 16 | 18 | 14 | 13 | 8 | 15 | 5 | 15 | 10 | 8 | 4 | 0 | -5 | 3 | 2 | 24 | 10.3 |
| NO. | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 28 | 29 | 28 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 29 | | |
| MAX. | 21 | 24 | 24 | 14 | 31 | 24 | 32 | 46 | 32 | 19 | 20 | 35 | 20 | 18 | 190 | 32 | 22 | 78 | 13 | 48 | 17 | 50 | 12 | 23 | | |
| AVG. | 3 | 6 | 6 | 4 | 4 | 6 | 9 | 11 | 14 | 8 | 8 | 9 | 6 | 5 | 14 | 6 | 6 | 10 | 3 | 4 | -1 | 2 | 3 | 5 | | |

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

**Qualifier Codes and Descriptions**

**as of 12-APR-07**

| Qualifier Type | Qualifier Type Desc | Qualifier Code | Qualifier Desc |
|---|---|---|---|
| EX | Exceptional Event Qualifier | D | SANDBLASTING |
| | | F | STRUCTURAL FIRE |
| | | H | CHEMICAL SPILLS & INDUST. ACCIDENTS |
| | | I | UNUSUAL TRAFFIC CONGESTION |
| | | J | CONSTRUCTION/DEMOLITION |
| | | K | AGRICULTURAL TILLING |
| | | L | HIGHWAY CONSTRUCTION |
| | | M | REROUTING OF TRAFFIC |
| | | N | SANDING/SALTING OF STREETS |
| | | O | INFREQUENT LARGE GATHERINGS |
| | | P | ROOFING OPERATIONS |
| | | Q | PRESCRIBED BURNING |
| | | R | CLEAN UP AFTER A MAJOR DISASTER |
| NAT | Natural Event Qualifier | A | HIGH WINDS |
| | | B | STRATOSPHERIC OZONE INTRUSION |
| | | C | VOLCANIC ERUPTIONS |
| | | E | FOREST FIRE |
| | | G | HIGH POLLEN COUNT |
| | | S | SEISMIC ACTIVITY |
| | | U | SAHARA DUST |
| NULL | Null Data Qualifier | AA | SAMPLE PRESSURE OUT OF LIMITS |
| | | AB | TECHNICIAN UNAVAILABLE |
| | | AC | CONSTRUCTION/REPAIRS IN AREA |
| | | AD | SHELTER STORM DAMAGE |
| | | AE | SHELTER TEMPERATURE OUTSIDE LIMITS |
| | | AF | SCHEDULED BUT NOT COLLECTED |
| | | AG | SAMPLE TIME OUT OF LIMITS |
| | | AH | SAMPLE FLOW RATE OUT OF LIMITS |
| | | AI | INSUFFICIENT DATA (CANNOT CALCULATE) |
| | | AJ | FILTER DAMAGE |
| | | AK | FILTER LEAK |
| | | AL | VOIDED BY OPERATOR |
| | | AM | MISCELLANEOUS VOID |
| | | AN | MACHINE MALFUNCTION |
| | | AO | BAD WEATHER |
| | | AP | VANDALISM |
| | | AQ | COLLECTION ERROR |
| | | AR | LAB ERROR |
| | | AS | POOR QUALITY ASSURANCE RESULTS |
| | | AT | CALIBRATION |
| | | AU | MONITORING WAIVED |
| | | AV | POWER FAILURE (POWR) |
| | | AW | WILDLIFE DAMAGE |
| | | AX | PRECISION CHECK (PREC) |
| | | AY | Q C CONTROL POINTS (ZERO/SPAN) |
| | | AZ | Q C AUDIT (AUDT) |

| | | | |
|---|---|---|---|
| | | BA | MAINTENANCE/ROUTINE REPAIRS |
| | | BB | UNABLE TO REACH SITE |
| | | BC | MULTI-POINT CALIBRATION |
| | | BD | AUTO CALIBRATION |
| | | BE | BUILDING/SITE REPAIR |
| | | BF | PRECISION/ZERO/SPAN |
| | | BG | Missing ozone data not likely to exceed level of standard |
| | | BH | Interference/co-elution |
| | | BI | Lost or damaged in transit |
| | | BJ | Operator Error |
| | | BK | Site computer/data logger down |
| | | SA | Storm Approaching |
| QA | Quality Assurance Qualifier | 1 | Deviation from a CFR/Critical Criteria Requirement |
| | | 2 | Operational Deviation |
| | | 3 | Field Issue |
| | | 4 | Lab Issue |
| | | 5 | Outlier |
| | | 6 | QAPP Issue |
| | | 7 | Below Lowest Calibration Level |
| | | 9 | Negative value detected - zero reported |
| | | MD | Value between MDL and IDL |
| | | ND | No Value Detected |
| | | SQ | Values Between SQL and MDL |
| | | V | VALIDATED VALUE |
| | | W | FLOW RATE AVERAGE OUT OF SPEC. |
| | | X | FILTER TEMPERATURE DIFFERENCE OUT OF SPEC. |
| | | Y | ELAPSED SAMPLE TIME OUT OF SPEC. |

# ATTACHMENT 1

## LABORATORY ANALYTICAL REPORTS

***Note***: Non-applicable portions of laboratory reports have been excluded.

Tuesday, April 28, 2009

Analytical Laboratory

Steve Heck
Kuipers & Associates, LLC
P.O. Box 641
Butte, MT 59703

RE: DUSTFALL BUCKETS

Work Order: 0904042

Dear Steve Heck:

MSE Lab Services received 3 sample(s) on 4/7/2009 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Marcee Cameron

Marcee Cameron
Laboratory Director/ Chemist
406-494-7371

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

E-MAILED
4/29/09 MC

# MSE Lab Services

**Date:** *30-Apr-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0904042
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0904042-001

**Client Sample ID:** KA-DF-OPP-006
**Collection Date:** 4/5/2009 2:50:00 PM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 0.462 | 0.053 | | µg/L | 1 | 4/27/2009 |
| Cadmium | 0.040 | 0.004 | | µg/L | 1 | 4/27/2009 |
| Copper | 1.41 | 0.044 | | µg/L | 1 | 4/27/2009 |
| Lead | 0.120 | 0.007 | | µg/L | 1 | 4/27/2009 |
| Zinc | 9.20 | 0.105 | | µg/L | 1 | 4/27/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | ND | 10 | | mg/L | 1 | 4/10/2009 |

SW **Review**

**Qualifiers:**

| | | | |
|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

# MSE Lab Services

**Date:** *30-Apr-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0904042
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0904042-002

**Client Sample ID:** KA-DF-OPP-007
**Collection Date:** 4/5/2009 2:50:00 PM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 0.625 | 0.050 | | µg/L | 1 | 4/27/2009 |
| Cadmium | 0.072 | 0.003 | | µg/L | 1 | 4/27/2009 |
| Copper | 1.34 | 0.042 | | µg/L | 1 | 4/27/2009 |
| Lead | 0.249 | 0.007 | | µg/L | 1 | 4/27/2009 |
| Zinc | 6.95 | 0.100 | | µg/L | 1 | 4/27/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | ND | 10 | | mg/L | 1 | 4/10/2009 |

**Review**

**Qualifiers:**

| | | | |
|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

# MSE Lab Services

**Date:** *30-Apr-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0904042
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0904042-003

**Client Sample ID:** KA-DF-WS-005
**Collection Date:** 4/5/2009 1:02:00 PM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 0.222 | 0.054 | | µg/L | 1 | 4/27/2009 |
| Cadmium | 0.045 | 0.004 | | µg/L | 1 | 4/27/2009 |
| Copper | 0.949 | 0.045 | | µg/L | 1 | 4/27/2009 |
| Lead | 0.079 | 0.007 | | µg/L | 1 | 4/27/2009 |
| Zinc | 5.16 | 0.108 | | µg/L | 1 | 4/27/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | ND | 10 | | mg/L | 1 | 4/10/2009 |

**Review**

**Qualifiers:**

| | | | |
|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 30-Apr-09
**Report Date:** 28-Apr-09

# QA/QC SUMMARY REPORT

**Client:** Kuipers & Associates, LLC
**Project:** DUSTFALL BUCKETS

**Work Order:** 0904042
**BatchID:** 2372

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***2372-PB*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2372*** | | | | *Analysis Date:* ***4/27/2009*** | |
| Arsenic | ND | 1.50 | µg/L | | | | | | | |
| Cadmium | ND | 0.100 | µg/L | | | | | | | |
| Copper | ND | 1.25 | µg/L | | | | | | | |
| Lead | 0.147 | 0.200 | µg/L | | | | | | | J |
| Zinc | ND | 3.00 | µg/L | | | | | | | |
| *Sample ID:* ***2372-LCS*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2372*** | | | | *Analysis Date:* ***4/27/2009*** | |
| Arsenic | 16.3 | 1.50 | µg/L | 20.00 | 81.7 | 80 | 120 | | | |
| Cadmium | 1.76 | 0.100 | µg/L | 2.000 | 87.9 | 80 | 120 | | | |
| Copper | 19.5 | 1.25 | µg/L | 20.00 | 97.6 | 80 | 120 | | | |
| Lead | 19.4 | 0.200 | µg/L | 20.00 | 97.2 | 80 | 120 | | | |
| Zinc | 324 | 3.00 | µg/L | 400.0 | 81.0 | 80 | 120 | | | |
| *Sample ID:* ***0904042-001AMS*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2372*** | | | | *Analysis Date:* ***4/27/2009*** | |
| Arsenic | 1.10 | 0.053 | µg/L | 0.7018 | 91.2 | 70 | 130 | | | |
| Cadmium | 0.831 | 0.004 | µg/L | 0.8772 | 90.2 | 70 | 130 | | | |
| Copper | 5.35 | 0.044 | µg/L | 4.386 | 89.9 | 70 | 130 | | | |
| Lead | 0.488 | 0.007 | µg/L | 0.3509 | 105 | 70 | 130 | | | |
| Zinc | 17.4 | 0.105 | µg/L | 8.772 | 93.1 | 70 | 130 | | | |
| *Sample ID:* ***0904042-001AMSD*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2372*** | | | | *Analysis Date:* ***4/27/2009*** | |
| Arsenic | 1.09 | 0.053 | µg/L | 0.7018 | 89.6 | 70 | 130 | 1.03 | 20 | |
| Cadmium | 0.831 | 0.004 | µg/L | 0.8772 | 90.1 | 70 | 130 | 0.0936 | 20 | |
| Copper | 5.33 | 0.044 | µg/L | 4.386 | 89.3 | 70 | 130 | 0.480 | 20 | |
| Lead | 0.492 | 0.007 | µg/L | 0.3509 | 106 | 70 | 130 | 0.753 | 20 | |
| Zinc | 17.3 | 0.105 | µg/L | 8.772 | 92.1 | 70 | 130 | 0.479 | 20 | |

Review

**Qualifiers:**
NA Sample conc. Is > 4*spike level
S Spike Recovery outside accepted recovery limits

MSE Analytical Laboratory
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200 Technology Way
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Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 30-Apr-09
**Report Date:** 28-Apr-09

# QA/QC SUMMARY REPORT

**Client:** Kuipers & Associates, LLC
**Project:** DUSTFALL BUCKETS

**Work Order:** 0904042
**BatchID:** R9394

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***LCS WC2068*** | | | *Method:* ***A2540C*** | | *Batch ID:* ***R9394*** | | | *Analysis Date:* ***4/10/2009*** | | |
| TDS | 783 | 10 | mg/L | 833.0 | 94.0 | 80 | 120 | | | |
| *Sample ID:* ***PB*** | | | *Method:* ***A2540C*** | | *Batch ID:* ***R9394*** | | | *Analysis Date:* ***4/10/2009*** | | |
| TDS | ND | 10 | mg/L | | | | | | | |

Review

**Qualifiers:**
NA Sample conc. Is > 4*spike level
S Spike Recovery outside accepted recovery limits

FORM MSE-169
(Init. 06/06)

MSE Technology Applications, Inc.
Laboratory Services

# CHAIN OF CUSTODY

PROJECT ID: Kuipers + Associates

LABORATORY PERFORMING ANALYSIS:

SAMPLERS (Signature): Steven R Heck

ANALYSIS REQUESTED: As, Cd, Cu, Pb, Zn; TOTAL PARTICULATES

REMARKS: Turnaround Time (TAT)

☒ Standard TAT

☐ Rush TAT (please contact laboratory personnel for arrangements)

| SAMPLE ID | LAB ID | DATE | TIME | As, Cd, Cu, Pb, Zn | TOTAL PARTICULATES | REMARKS |
|---|---|---|---|---|---|---|
| KA-DF-OPP-006 | 0904042-001A | 4-5-09 | 1450 | X | X | OPP-A 3-2-09 to 4-5-09 |
| KA-DF-OPP-007 | 002A | 4-5-09 | 1450 | X | X | OPP-B 3-2-09 to 4-5-09 |
| KA-DF-WS-005 | 003A | 4-5-09 | 1302 | X | X | WS 3-2-09 to 4-5-09 |

| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
|---|---|---|---|---|---|
| Steven R Heck | 4-7-09 | 0927 | Sara Ward | 4/7/09 | 0927 |
| PRINTED NAME / COMPANY | | | PRINTED NAME / COMPANY | | |
| Steven R. Heck / Blacktail Cons. | | | Sara Ward / MSE-TA | | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME / COMPANY | | | PRINTED NAME / COMPANY | | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME / COMPANY | | | PRINTED NAME / COMPANY | | |

COMMENTS: n/d in box
12.5°C

MSE LABORATORY SERVICES
200 Technology Way, P.O. Box 4078
Butte, MT 59701
PH: (406) 494-7334 / FAX: (406) 494-7230

MSE Lab Services

## Sample Receipt Checklist

Client Name KUIPERS&ASSOC  Date and Time Received: 4/7/2009 1:11:21 PM

Work Order Number 0904042  RcptNo: 1  Received by SW

COC_ID:  CoolerID:

Checklist completed by Sara Ward 4/7/09 (Signature / Date)  Reviewed by MC 4/28/09 (Initials / Date)

Matrix:  Carrier name Hand-Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☑ | No ☐ | Not Present ☐ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☐ | No ☑ | |
| Water - VOA vials have zero headspace? | No VOA vials submitted ☑ | Yes ☐ | No ☐ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | Blank ☐ |

Adjusted? No  Checked by KW 4-10-09

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: TEMP=12.5oC; SEALED DUSTFALL BUCKETS H/D IN BOX ~ Sealed w/ black tape

Corrective Action _____

Thursday, July 23, 2009

Analytical Laboratory

Steve Heck
Kuipers & Associates, LLC
P.O. Box 641
Butte, MT 59703

RE: DUSTFALL BUCKETS

Work Order: 0906034

Dear Steve Heck:

MSE Lab Services received 5 sample(s) on 6/3/2009 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Marcee Cameron

Marcee Cameron
Laboratory Director/ Chemist
406-494-7371

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

E-MAILED
7/24 MC

# MSE Lab Services

**Date:** *23-Jul-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0906034
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0906034-001

**Client Sample ID:** KA-DF-OPP-008(4-5-09/6-1-0
**Collection Date:** 6/1/2009 10:58:00 AM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 9.26 | 0.113 | | µg/L | 1 | 7/13/2009 |
| Cadmium | 0.351 | 0.008 | | µg/L | 1 | 7/13/2009 |
| Copper | 28.7 | 0.094 | | µg/L | 1 | 7/13/2009 |
| Lead | 6.35 | 0.015 | | µg/L | 1 | 7/13/2009 |
| Zinc | 44.7 | 0.227 | | µg/L | 1 | 7/13/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | 63 | 10 | | mg/L | 1 | 6/8/2009 |

**Review**

| Qualifiers: | | | | |
|---|---|---|---|---|
| | E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| | J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

# MSE Lab Services

**Date:** *23-Jul-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0906034
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0906034-002

**Client Sample ID:** KA-DF-WS-006(4-5-09/6-1-09
**Collection Date:** 6/1/2009 12:25:00 PM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 2.96 | 0.124 | | µg/L | 1 | 7/13/2009 |
| Cadmium | 0.300 | 0.008 | | µg/L | 1 | 7/13/2009 |
| Copper | 11.1 | 0.103 | | µg/L | 1 | 7/13/2009 |
| Lead | 3.13 | 0.017 | | µg/L | 1 | 7/13/2009 |
| Zinc | 24.5 | 0.248 | | µg/L | 1 | 7/13/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | 36 | 10 | | mg/L | 1 | 6/8/2009 |

**Review**

| Qualifiers: | | | | |
|---|---|---|---|---|
| | E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| | J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

MSE-TA Analytical Laboratory
*P.O. Box 4078*
*200 Technology Way*
*Butte, MT 59701*
*Lab: 406-494-7334*
*Fax: 406-494-7230*
*labinfo@mse-ta.com*

# MSE Lab Services

**Date:** *23-Jul-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0906034
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0906034-003

**Client Sample ID:** KA-DF-FB-005(6-1-09)
**Collection Date:** 6/1/2009 12:25:00 PM
**Matrix:** AQUEOUS

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **SW-846 ICP-MS METALS, TOTAL** | | **SW6020A** | | **E200.2** | | Analyst: **SW** |
| Arsenic | 0.027 | 0.084 | J | µg/L | 1 | 7/13/2009 |
| Cadmium | 0.025 | 0.006 | | µg/L | 1 | 7/13/2009 |
| Copper | 0.199 | 0.070 | | µg/L | 1 | 7/13/2009 |
| Lead | 0.049 | 0.011 | | µg/L | 1 | 7/13/2009 |
| Zinc | 1.50 | 0.167 | | µg/L | 1 | 7/13/2009 |
| **TOTAL DISSOLVED SOLIDS** | | **A2540C** | | | | Analyst: **kgw** |
| TDS | ND | 10 | | mg/L | 1 | 6/8/2009 |

**Review**

| **Qualifiers:** | | | | |
|---|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

MSE-TA Analytical Laboratory
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*Butte, MT 59701*
*Lab: 406-494-7334*
*Fax: 406-494-7230*
*labinfo@mse-ta.com*

# MSE Lab Services

**Date:** *23-Jul-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0906034
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0906034-004

**Client Sample ID:** KA-SP-OPP-4-49035(3-2-09/6
**Collection Date:** 6/1/2009 10:58:00 AM
**Matrix:** SOLID

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **ICP-MS METALS, SOLID SAMPLES** | | **SW6020** | | **SW3050B** | | Analyst: **SW** |
| Arsenic | 66.6 | 0.870 | | mg/Kg | 1 | 7/13/2009 |
| Cadmium | 2.07 | 0.058 | | mg/Kg | 1 | 7/13/2009 |
| Copper | 232 | 0.725 | | mg/Kg | 1 | 7/13/2009 |
| Lead | 59.4 | 0.116 | | mg/Kg | 1 | 7/13/2009 |
| Zinc | 282 | 1.74 | | mg/Kg | 1 | 7/13/2009 |
| **FILTER & SAMPLE WEIGHT - FILTER ANALYSIS** | | **MISC** | | | | Analyst: **BO** |
| Sample/Filter Weight | 0.0862 | 0.0001 | | g | 1 | 6/23/2009 |

**Review**

| Qualifiers: | | | | |
|---|---|---|---|---|
| | E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| | J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

MSE-TA Analytical Laboratory
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*Lab: 406-494-7334*
*Fax: 406-494-7230*
*labinfo@mse-ta.com*

# MSE Lab Services

**Date:** *23-Jul-09*

**CLIENT:** Kuipers & Associates, LLC
**Lab Order:** 0906034
**Project:** DUSTFALL BUCKETS
**Lab ID:** 0906034-005

**Client Sample ID:** KA-SP-WS-4-49104(3-2-09/6-
**Collection Date:** 6/1/2009 12:25:00 PM
**Matrix:** SOLID

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **ICP-MS METALS, SOLID SAMPLES** | | **SW6020** | | **SW3050B** | | Analyst: **SW** |
| Arsenic | 12.1 | 1.31 | | mg/Kg | 1 | 7/13/2009 |
| Cadmium | 0.951 | 0.087 | | mg/Kg | 1 | 7/13/2009 |
| Copper | 62.4 | 1.09 | | mg/Kg | 1 | 7/13/2009 |
| Lead | 21.0 | 0.174 | | mg/Kg | 1 | 7/13/2009 |
| Zinc | 124 | 2.61 | | mg/Kg | 1 | 7/13/2009 |
| **FILTER & SAMPLE WEIGHT - FILTER ANALYSIS** | | **MISC** | | | | Analyst: **BO** |
| Sample/Filter Weight | 0.0574 | 0.0001 | | g | 1 | 6/23/2009 |

**Review**

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | E | Value above quantitation range | | H | Holding times for preparation or analysis exceeded |
| | J | Analyte detected below the Reporting Limit | | Limit | Instrument Reporting Limit |
| | MDL | Method Detection Limit | | ND | Not Detected at the Method Detection Limit (MDL) |

MSE-TA Analytical Laboratory
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Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 23-Jul-09
**Report Date:** 23-Jul-09

# QA/QC SUMMARY REPORT

**Client:** Kuipers & Associates, LLC
**Project:** DUSTFALL BUCKETS

**Work Order:** 0906034
**BatchID:** 2488

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***2488-PB*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2488*** | | | *Analysis Date:* ***7/13/2009*** | | |
| Arsenic | ND | 1.50 | µg/L | | | | | | | |
| Cadmium | ND | 0.100 | µg/L | | | | | | | |
| Copper | ND | 1.25 | µg/L | | | | | | | |
| Lead | 0.086 | 0.200 | µg/L | | | | | | | |
| Zinc | ND | 3.00 | µg/L | | | | | | | |
| *Sample ID:* ***WET CHEM BLANK*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2488*** | | | *Analysis Date:* ***7/13/2009*** | | |
| Arsenic | ND | 1.50 | µg/L | | | | | | | |
| Cadmium | 0.046 | 0.100 | µg/L | | | | | | | |
| Copper | 0.812 | 1.25 | µg/L | | | | | | | |
| Lead | 0.182 | 0.200 | µg/L | | | | | | | |
| Zinc | 6.47 | 3.00 | µg/L | | | | | | | |
| *Sample ID:* ***2488-LCS*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2488*** | | | *Analysis Date:* ***7/13/2009*** | | |
| Arsenic | 19.2 | 1.50 | µg/L | 20.00 | 95.9 | 80 | 120 | | | |
| Cadmium | 1.96 | 0.100 | µg/L | 2.000 | 98.2 | 80 | 120 | | | |
| Copper | 22.8 | 1.25 | µg/L | 20.00 | 114 | 80 | 120 | | | |
| Lead | 21.0 | 0.200 | µg/L | 20.00 | 105 | 80 | 120 | | | |
| Zinc | 365 | 3.00 | µg/L | 400.0 | 91.2 | 80 | 120 | | | |
| *Sample ID:* ***0906034-002AMS*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2488*** | | | *Analysis Date:* ***7/13/2009*** | | |
| Arsenic | 4.57 | 0.124 | µg/L | 1.652 | 97.1 | 70 | 130 | | | |
| Cadmium | 2.35 | 0.008 | µg/L | 2.065 | 99.5 | 70 | 130 | | | |
| Copper | 22.2 | 0.103 | µg/L | 10.32 | 107 | 70 | 130 | | | |
| Lead | 3.91 | 0.017 | µg/L | 0.8260 | 93.9 | 70 | 130 | | | |
| Zinc | 45.9 | 0.248 | µg/L | 20.65 | 103 | 70 | 130 | | | |
| *Sample ID:* ***0906034-002AMSD*** | | | *Method:* ***SW6020A*** | | *Batch ID:* ***2488*** | | | *Analysis Date:* ***7/13/2009*** | | |
| Arsenic | 4.55 | 0.124 | µg/L | 1.652 | 95.8 | 70 | 130 | 0.444 | 20 | |
| Cadmium | 2.37 | 0.008 | µg/L | 2.065 | 100 | 70 | 130 | 0.826 | 20 | |
| Copper | 21.5 | 0.103 | µg/L | 10.32 | 101 | 70 | 130 | 2.91 | 20 | |
| Lead | 3.83 | 0.017 | µg/L | 0.8260 | 84.1 | 70 | 130 | 2.10 | 20 | |
| Zinc | 45.2 | 0.248 | µg/L | 20.65 | 100 | 70 | 130 | 1.59 | 20 | |

Review

**Qualifiers:**
NA Sample conc. Is > 4*spike level
R RPD outside accepted recovery limits

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 23-Jul-09
**Report Date:** 23-Jul-09

# QA/QC SUMMARY REPORT

**Client:** Kuipers & Associates, LLC
**Work Order:** 0906034
**Project:** DUSTFALL BUCKETS
**BatchID:** 2517

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***2517-PB-UNFILTERED*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2517*** | | | | *Analysis Date:* ***7/13/2009*** | |
| Arsenic | ND | 0.150 | mg/Kg | | | | | | | |
| Cadmium | ND | 0.010 | mg/Kg | | | | | | | |
| Copper | ND | 0.125 | mg/Kg | | | | | | | |
| Lead | ND | 0.020 | mg/Kg | | | | | | | |
| Zinc | ND | 0.300 | mg/Kg | | | | | | | |
| *Sample ID:* ***2517-PB-FILTERED*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2517*** | | | | *Analysis Date:* ***7/13/2009*** | |
| Arsenic | ND | 0.150 | mg/Kg | | | | | | | |
| Cadmium | ND | 0.010 | mg/Kg | | | | | | | |
| Copper | ND | 0.125 | mg/Kg | | | | | | | |
| Lead | ND | 0.020 | mg/Kg | | | | | | | |
| Zinc | ND | 0.300 | mg/Kg | | | | | | | |
| *Sample ID:* ***2517-LCS*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2517*** | | | | *Analysis Date:* ***7/13/2009*** | |
| Arsenic | 125 | 0.147 | mg/Kg | 129.8 | 96.1 | 80 | 120 | | | |
| Cadmium | 56.1 | 0.010 | mg/Kg | 55.65 | 101 | 80 | 120 | | | |
| Copper | 60.4 | 0.123 | mg/Kg | 60.08 | 101 | 80 | 120 | | | |
| Lead | 322 | 0.020 | mg/Kg | 308.8 | 104 | 80 | 120 | | | |
| Zinc | 241 | 0.295 | mg/Kg | 247.8 | 97.2 | 80 | 120 | | | |
| *Sample ID:* ***0906034-005AMS*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2517*** | | | | *Analysis Date:* ***7/13/2009*** | |
| Arsenic | 29.4 | 1.31 | mg/Kg | 17.42 | 99.4 | 75 | 125 | | | |
| Cadmium | 22.6 | 0.087 | mg/Kg | 21.78 | 99.3 | 75 | 125 | | | |
| Copper | 178 | 1.09 | mg/Kg | 108.9 | 106 | 75 | 125 | | | |
| Lead | 29.3 | 0.174 | mg/Kg | 8.711 | 94.3 | 75 | 125 | | | |
| Zinc | 350 | 2.61 | mg/Kg | 217.8 | 104 | 75 | 125 | | | |
| *Sample ID:* ***0906034-005AMSD*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2517*** | | | | *Analysis Date:* ***7/13/2009*** | |
| Arsenic | 28.8 | 1.31 | mg/Kg | 17.42 | 95.7 | 75 | 125 | 2.21 | 20 | |
| Cadmium | 22.2 | 0.087 | mg/Kg | 21.78 | 97.5 | 75 | 125 | 1.78 | 20 | |
| Copper | 173 | 1.09 | mg/Kg | 108.9 | 102 | 75 | 125 | 2.63 | 20 | |
| Lead | 28.4 | 0.174 | mg/Kg | 8.711 | 84.1 | 75 | 125 | 3.10 | 20 | |
| Zinc | 345 | 2.61 | mg/Kg | 217.8 | 101 | 75 | 125 | 1.69 | 20 | |

Review

**Qualifiers:**
NA Sample conc. Is > 4*spike level
R RPD outside accepted recovery limits

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 23-Jul-09
**Report Date:** 23-Jul-09

# QA/QC SUMMARY REPORT

**Client:** Kuipers & Associates, LLC
**Work Order:** 0906034
**Project:** DUSTFALL BUCKETS
**BatchID:** R9860

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***LCS WC2097*** | | | *Method:* ***A2540C*** | | *Batch ID:* ***R9860*** | | | | *Analysis Date:* ***6/8/2009*** | |
| TDS | 810 | 10 | mg/L | 833.0 | 97.2 | 80 | 120 | | | |
| *Sample ID:* ***PB*** | | | *Method:* ***A2540C*** | | *Batch ID:* ***R9860*** | | | | *Analysis Date:* ***6/8/2009*** | |
| TDS | ND | 10 | mg/L | | | | | | | |

Review

**Qualifiers:**
NA Sample conc. Is > 4*spike level
R RPD outside accepted recovery limits

FORM MSE-169
(Rev. 09/08)

MSE Technology Applications, Inc.
Laboratory Services

# CHAIN OF CUSTODY

MSE WORK ORDER # 0906034

| | |
|---|---|
| Company Name: Kuipers + Associates | Project Manager: Steve Heck |
| Address: | Project Name and Number: |
| City: State: Zip: | Email Address: sheck@rfwave.net |
| Phone: 498-4199 | Purchase Order #: |
| Fax: NA | Sampler Name and Phone #: |

ANALYSIS REQUESTED: As, Cd, Cu, Pb, Zn; TOTAL PARTICULATES

REMARKS

Turnaround Time (TAT) / Reporting

X Standard
___Next Day*
___2nd Day*
___Other*

*All rush order requests must have prior approval

___Phone
___Mail
___Fax
X Email

| SAMPLE ID | LAB ID | DATE | TIME | As, Cd, Cu, Pb, Zn | TOTAL PARTICULATES |
|---|---|---|---|---|---|
| KA-DF-OPP-008 (4-5-09 to 6-1-09) | 0906034-001A | 6-1-09 | 1058 | X | X |
| KA-DF-WS-006 (4-5-09 to 6-1-09) | 002A | 6-1-09 | 1225 | X | X |
| KA-DF-FB-005 (6-1-09) | 003A | 6-1-09 | 1225 | X | X |
| KA-SP-OPP-4-49035 (3-2-09 to 6-1-09) | 004A | 6-1-09 | 1058 | X | X |
| KA-SP-WS-4-49104 (3-2-09 to 6-1-09) | 005A | 6-1-09 | 1225 | X | X |

No alcohol this time.
Please ensure prep blank for DF jars carried throughoven
Contact Steve Heck when ready to weigh Cassette filters

| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
|---|---|---|---|---|---|
| Steven R Heck | 6-1-09 | 1530 | Sara Ward | 6/1/09 | 1530 |
| PRINTED NAME: Steven R Heck | COMPANY: Blacktail Cons. | | PRINTED NAME: Sara Ward | COMPANY: MSE-TA | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME | COMPANY | | PRINTED NAME | COMPANY | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME | COMPANY | | PRINTED NAME | COMPANY | |

Inspection Checklist

| | | |
|---|---|---|
| Received Intact? | (Y) | N |
| Labels & Chains Agree? | (Y) | N |
| Containers Sealed? | Y | (N) |
| Cooler Sealed? | NA Y | N |

Delivery Method: h/d no cooler/ice
Temperature (°C): 15.5°C
Preservative: NA
Date & Time: 6/1/09 1530
Inspected By: SN

MSE LABORATORY SERVICES
200 Technology Way, P.O. Box 4078
Butte, MT 59701
PH: (406) 494-7334 / FAX: (406) 494-7128
labinfo@mse-ta.com

## MSE Lab Services

### Sample Receipt Checklist

Client Name KUIPERS&ASSOC  Date and Time Received: 6/3/2009 1:20:26 PM

Work Order Number 0906034  RcptNo: 1  Received by SW

COC_ID:  CoolerID:

Checklist completed by Signature Date  Reviewed by Initials Date

Matrix:  Carrier name: Hand-Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☐ | No ☑ | |
| Water - VOA vials have zero headspace? | No VOA vials submitted ☑ | Yes ☐ | No ☐ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | Blank ☐ |

Adjusted?  Checked by 6-23-09

Samples evaporated for T-S by KW

Any No and/or NA (not applicable) response must be detailed in the comments section bel

Client contacted:  Date contacted:  Person contacted

Contacted by:  Regarding:

Comments: NO COOLER/ICE. TEMP=15.50C.

Corrective Action

Monday, August 10, 2009

Analytical Laboratory

Steve Heck
Blacktail Consulting
P.O. Box 4692
Butte, MT 59702

RE: BLACKTAIL CONSULTING

Work Order: 0907195

Dear Steve Heck:

MSE Lab Services received 9 sample(s) on 7/24/2009 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Marcee Cameron

Marcee Cameron
Laboratory Director/ Chemist
406-494-7371

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

E-MAILED
8/10 MC

# MSE Lab Services

**Date:** *10-Aug-09*

**CLIENT:** Blacktail Consulting
**Lab Order:** 0907195
**Project:** BLACKTAIL CONSULTING
**Lab ID:** 0907195-007

**Client Sample ID:** KA-SP-OPP-4-49151
**Collection Date:** 7/10/2009 2:45:00 PM
**Matrix:** SOLID

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **ICP-MS METALS, SOLID SAMPLES** | | **SW6020** | | **SW3050B** | | Analyst: **SW** |
| Arsenic | 29.7 | 1.21 | | mg/Kg | 1 | 8/2/2009 |
| Cadmium | 0.854 | 0.081 | | mg/Kg | 1 | 8/2/2009 |
| Copper | 94.2 | 1.01 | | mg/Kg | 1 | 8/2/2009 |
| Lead | 24.5 | 0.162 | | mg/Kg | 1 | 8/2/2009 |
| Zinc | 114 | 2.43 | | mg/Kg | 1 | 8/2/2009 |
| **FILTER & SAMPLE WEIGHT - FILTER ANALYSIS** | | **MISC** | | | | Analyst: **BO** |
| Sample/Filter Weight | 0.0618 | 0.0001 | | g | 1 | 7/30/2009 |

**Review**

| **Qualifiers:** | | | | |
|---|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

# MSE Lab Services

**Date:** *10-Aug-09*

**CLIENT:** Blacktail Consulting
**Lab Order:** 0907195
**Project:** BLACKTAIL CONSULTING
**Lab ID:** 0907195-008

**Client Sample ID:** KA-SP-WS-4-49383
**Collection Date:** 7/10/2009 12:13:00 PM
**Matrix:** SOLID

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **ICP-MS METALS, SOLID SAMPLES** | | **SW6020** | | **SW3050B** | | Analyst: **SW** |
| Arsenic | 0.941 | 1.49 | J | mg/Kg | 1 | 8/2/2009 |
| Cadmium | 0.504 | 0.100 | | mg/Kg | 1 | 8/2/2009 |
| Copper | 7.18 | 1.25 | | mg/Kg | 1 | 8/2/2009 |
| Lead | 3.11 | 0.199 | | mg/Kg | 1 | 8/2/2009 |
| Zinc | 33.8 | 2.99 | | mg/Kg | 1 | 8/2/2009 |
| **FILTER & SAMPLE WEIGHT - FILTER ANALYSIS** | | **MISC** | | | | Analyst: **BO** |
| Sample/Filter Weight | 0.0502 | 0.0001 | | g | 1 | 7/30/2009 |

**Review**

**Qualifiers:**

| | | | |
|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

# MSE Lab Services

**Date:** *10-Aug-09*

**CLIENT:** Blacktail Consulting
**Lab Order:** 0907195
**Project:** BLACKTAIL CONSULTING
**Lab ID:** 0907195-009

**Client Sample ID:** KA-SP-FB-4-49308
**Collection Date:** 7/22/2009 11:15:00 AM
**Matrix:** SOLID

| Analyses | Result | Limit | Qualifier | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **ICP-MS METALS, SOLID SAMPLES** | | **SW6020** | | **SW3050B** | | Analyst: **SW** |
| Arsenic | ND | 1.60 | | mg/Kg | 1 | 8/2/2009 |
| Cadmium | ND | 0.107 | | mg/Kg | 1 | 8/2/2009 |
| Copper | 0.456 | 1.33 | J | mg/Kg | 1 | 8/2/2009 |
| Lead | 0.158 | 0.213 | J | mg/Kg | 1 | 8/2/2009 |
| Zinc | 22.1 | 3.20 | | mg/Kg | 1 | 8/2/2009 |
| **FILTER & SAMPLE WEIGHT - FILTER ANALYSIS** | | **MISC** | | | | Analyst: **BO** |
| Sample/Filter Weight | 0.0469 | 0.0001 | | g | 1 | 7/30/2009 |

**Review**

| **Qualifiers:** | | | | |
|---|---|---|---|---|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below the Reporting Limit | Limit | Instrument Reporting Limit |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit (MDL) |

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

**Date:** 10-Aug-09
**Report Date:** 10-Aug-09

# QA/QC SUMMARY REPORT

**Client:** Blacktail Consulting
**Project:** BLACKTAIL CONSULTING

**Work Order:** 0907195
**BatchID:** 2571

| Analyte | Result | RL | Units | Spike Lvl | % Rec | Low Limit | High Limit | RPD | RPD Limit | Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sample ID:* ***2571-PB-UNFILTERED*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2571*** | | | *Analysis Date:* ***8/2/2009*** | | |
| Arsenic | ND | 0.150 | mg/Kg | | | | | | | |
| Cadmium | ND | 0.010 | mg/Kg | | | | | | | |
| Copper | 0.062 | 0.125 | mg/Kg | | | | | | | J |
| Lead | ND | 0.020 | mg/Kg | | | | | | | |
| Zinc | ND | 0.300 | mg/Kg | | | | | | | |
| *Sample ID:* ***2571-PB-FILTERED*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2571*** | | | *Analysis Date:* ***8/2/2009*** | | |
| Arsenic | ND | 0.150 | mg/Kg | | | | | | | |
| Cadmium | ND | 0.010 | mg/Kg | | | | | | | |
| Copper | ND | 0.125 | mg/Kg | | | | | | | |
| Lead | 0.007 | 0.020 | mg/Kg | | | | | | | J |
| Zinc | ND | 0.300 | mg/Kg | | | | | | | |
| *Sample ID:* ***2571-LCS*** | | | *Method:* ***SW6020*** | | *Batch ID:* ***2571*** | | | *Analysis Date:* ***8/2/2009*** | | |
| Arsenic | 59.1 | 0.149 | mg/Kg | 70.22 | 84.1 | 80 | 120 | | | |
| Cadmium | 189 | 0.010 | mg/Kg | 213.8 | 88.3 | 80 | 120 | | | |
| Copper | 153 | 0.124 | mg/Kg | 177.0 | 86.4 | 80 | 120 | | | |
| Lead | 76.0 | 0.020 | mg/Kg | 84.44 | 90.1 | 80 | 120 | | | |
| Zinc | 606 | 0.298 | mg/Kg | 652.5 | 92.9 | 80 | 120 | | | |

Review

**Qualifiers:** S Spike Recovery outside accepted recovery limits R RPD outside accepted recovery limits

FORM MSE-169
(Rev. 09/08)

MSE Technology Applications, Inc.
Laboratory Services

# CHAIN OF CUSTODY

MSE WORK ORDER # 0907195

| | |
|---|---|
| Company Name: Blacktail Consulting Inc. | Project Manager: Steve Heck |
| Address: PO Box 4697 | Project Name and Number: |
| City: Butte State: MT Zip: 59702 | Email Address: sheck@rfwave.net |
| Phone: 406-498-4199 | Purchase Order #: |
| Fax: ——— | Sampler Name and Phone #: S. Heck 498-4199 |

| SAMPLE ID | LAB ID | DATE | TIME | As, Cd, Cu, Pb, Zn | Filter Weights | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ANC-0709-0001DR | 0907195-001A | 7-22-09 | 1044 | X | X | | | | | |
| ANC-0709-0001L | 002A | 7-22-09 | 1017 | X | X | | | | | |
| ANC-0709-0001M | 003A | 7-22-09 | 1034 | X | X | | | | | |
| ANC-0709-0001B | 004A | 7-22-09 | 1058 | X | X | | | | | |
| ANC-0709-0002B | 005A | 7-22-09 | 1104 | X | X | | | | | |
| ANC-0709-0003B | 006A | 7-22-09 | 1110 | X | X | | | | | |
| | | | | | | | | | | |
| KA-SP-OFP-4-49151 | 007A | 7-10-09 | 1445 | X | X | | | | | |
| KA-SP-WS-4-49383 | 008A | 7-10-09 | 1213 | X | X | | | | | |
| KA-SP-FB-4-49308 | 009A | 7-22-09 | 1115 | X | X | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

ANALYSIS REQUESTED

REMARKS

Turnaround Time (TAT) / Reporting

| | | |
|---|---|---|
| ___Standard<br>___Next Day*<br>___2nd Day*<br>___Other* | *All rush order requests must have prior approval | ___Phone<br>___Mail<br>___Fax<br>___Email |

| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
|---|---|---|---|---|---|
| Steven R Heck | 7-23-09 | 1601 | Maree Cameron | 7/23/09 | 1601 |
| PRINTED NAME: Steven R. Heck | COMPANY: Blacktail Cons | | PRINTED NAME: M. Cameron | COMPANY: MSE | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME | COMPANY | | PRINTED NAME | COMPANY | |
| RELINQUISHED BY (Signature) | DATE | TIME | RECEIVED BY (Signature) | DATE | TIME |
| PRINTED NAME | COMPANY | | PRINTED NAME | COMPANY | |

Inspection Checklist

| | | |
|---|---|---|
| Received Intact? | (Y) | N |
| Labels & Chains Agree? | (Y) | N |
| Containers Sealed? | (Y) | N |
| Cooler Sealed? | Y | (N) |

Delivery Method: H/D NO cooler/ice IN BOX
Temperature (°C): n/a
Preservative: n/a
Date & Time: 7/23
Inspected By: MC

MSE LABORATORY SERVICES
200 Technology Way, P.O. Box 4078
Butte, MT 59701
PH: (406) 494-7334 / FAX: (406) 494-7128
labinfo@mse-ta.com

## MSE Lab Services

### Sample Receipt Checklist

Client Name **BLACKTAIL_CNSLT** Date and Time Received: **7/24/2009 7:59:57 AM**

Work Order Number **0907195** RcptNo: **1** Received by **MC**

COC_ID: CoolerID:

Checklist completed by Debbie Ortega 7-24-09 Reviewed by KW 7/25/09
Signature Date Initials Date

Matrix: Carrier name: Hand-Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☐ | No ☑ | |
| Water - VOA vials have zero headspace? | No VOA vials submitted ☑ | Yes ☐ | No ☐ |
| Water - pH acceptable upon receipt? NA | Yes ☐ | No ☐ | Blank ☐ |

Filters Adjusted? Checked by bo 7-24-09

Any No and/or NA (not applicable) response must be detailed in the comments section bel

Client contacted: Date contacted: Person contacted

Contacted by: Regarding:

Comments: REC'D IN BOX, NO ICE. TEMP=N/A(SOLID)

Corrective Action